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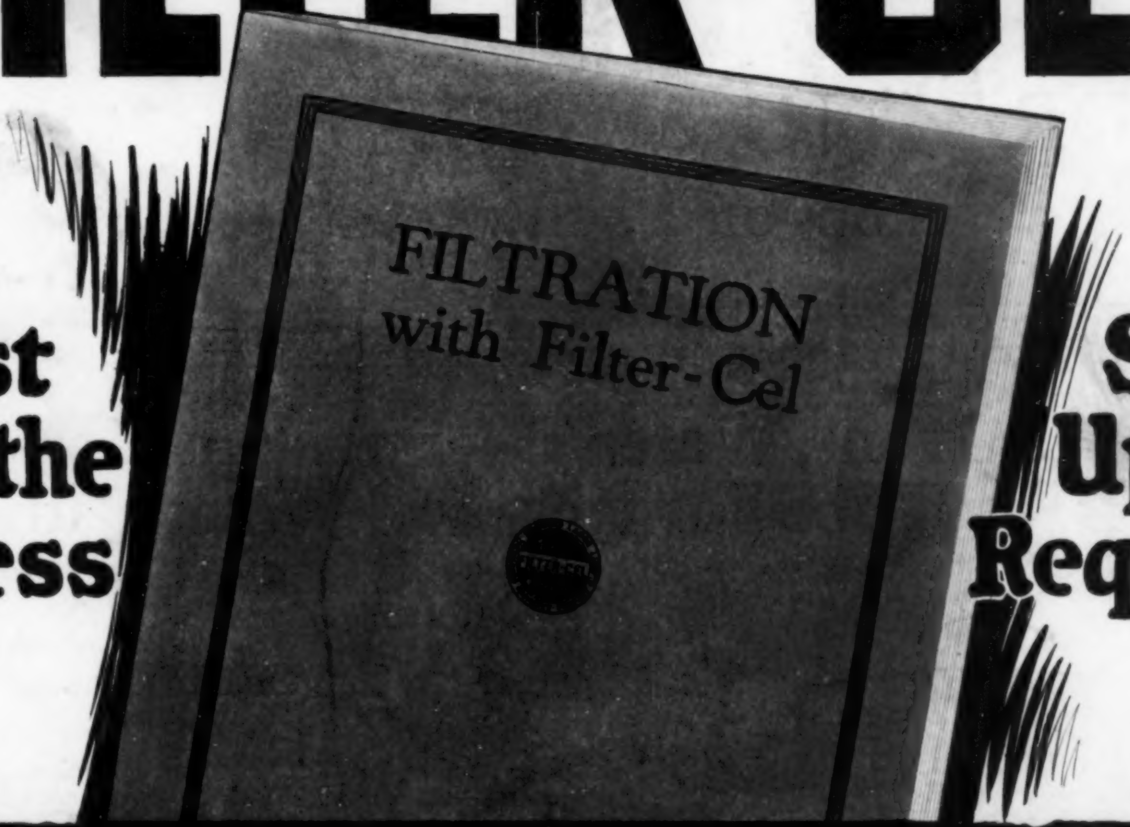

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CHEMICAL & METALLURGICAL ENGINEERING

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H. C. PARMELEE, Editor

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Christening a New Technology

APPROXIMATELY a billion dollars is expended annually by industry for products of mine or quarry in which the metal content is of little or no significance. Fluorspar, talc, feldspar, mica, gypsum, salt, graphite, sulphur and scores of other mineral products are attaining constantly increasing industrial importance and the consuming industries are requiring that more and more skill and care be used in their preparation. For many of these products this refining process goes far beyond those limits of milling or concentration that for non-metallic minerals would correspond to the ore dressing of metal-bearing ore. And this further preparation, which demands close control of chemical as well as physical properties of the product, calls for a new type of supervision and research. In the field of the metallic minerals this is the sort of service that is rendered by metallurgy. But obviously the metallurgist of orthodox training and common experience is not suited to supervise this work in the case of the non-metallics. The mining engineer is almost never enough of a chemical engineer to do the job with thorough satisfaction. It can scarcely be questioned, therefore, that there is real need here for a new group of technologists skilled in the science and engineering of the non-metallics.

The Bureau of Mines in the establishment of its new experiment station at Rutgers College, New Jersey, very properly recognizes these facts, for the new station will specialize in problems of producing and utilizing the non-metallic minerals. Dr. OLIVER BOWLES, who has been designated to head this new station, is eminently fitted for the task to which he has been appointed. He has studied many of these problems and has offered valuable guidance to numerous non-metallic industries. He represents precisely the type of specialist that must grow up in all of these lines if we are to have the maximum efficiency in the utilization of these valuable natural raw materials.

There is a wealth of these resources in the United States and in most cases we have been prone to look upon the supplies as inexhaustible. But, however abundant the supply may seem to be, the maximum skill used in the preparation of these raw materials for the chemical engineering industries will be well worth while. The direct saving in production cost per unit of quantity may not be great, but the usefulness and real value of the product will inevitably be increased. The production wastes which are eliminated and the by-products which are developed will doubtless more than pay the producing industries for their increased investment in supervision and research.

A Little Homily on The Man in the Works

AN AMERICAN ENGINEER resident in England has invented a mechanical system of treating numbers algebraically that is almost uncanny in what it accomplishes. It bids fair to throw a large number of clerks out of employment. At first glance that seems a pity, but in the end it may be a good thing for the clerks. Except in the light of tradition, is there really any distinction in a white collar job? Suppose it leads to a post of administration, how many men are competent in administration? They are very rare. And what kind of a life is more miserable than a position which the incumbent is not equipped to fill? Most of the young men in the office settle down later to posting letters or copying off figures or operating an adding machine—a class of work that is but little above the rank of unskilled labor.

We think the young man has a better chance if he goes into the works. There he can find himself. If he has mechanical skill, he has, under intelligent industrial administration, the opportunity to develop it. If he has the art of getting along with men, that, too, will soon come to the fore. If he has the mental equipment to be a good salesman, he is learning what other salesmen never learn: the strategems of manufacture and what the works can turn out with ease as well as the things that will cause trouble in production. In other words, he learns which are the most profitable wares to sell. And in the long run he is better paid.

Suppose he wants to improve his mind and to develop the graces of life. His work is over when the whistle blows, and all that is best in literature and art is his for the asking. Scarcely any private library or gallery is equal in scope at least to the public libraries and municipal galleries. There is nothing to hinder him from being a gentleman in appearance, in speech and in habit of mind.

Let's hark back to the medieval days when the guilds of craftsmen, of men who worked with their hands, were flourishing. The greatest treasures in art today are the work of those very men. There is nothing to prevent the craftsman of today from advancing, unless it be his native inhibitions or some unfortunate family connections.

The president, the secretary, the treasurer, the chief engineer and the general superintendent have no rest. Theirs is the worry about credits, about getting in materials, about making shipments, getting cars for loading, and finding new markets. Some of them may get around a bit later in the mornings, but their work is never done. Not one competent executive in a thousand can really shed his cares when he leaves the office.

His leisure is a respite from worry and he needs a frivolous musical comedy or a game of golf for his diversion. But the man in the works who takes off his jumper and washes up when the whistle blows can find a grassy spot under a greenwood tree and read to his heart's content in warm weather, or he can hear concerts, see the best plays, rejoice that PINERO has come back and admire JANE COWL in *Juliet*—in short, the beautiful things of life are his in response to his resolution to avail himself of them. There is no occasion for him to tie himself down to the movies or to literature for lazy minds or to hang around the drug store. He can leave that to the white collar boys in the office. Most of them are booked for the Vale of Discontent.

Why Not Make Our Own Synthetic "Valuables"?

OPPORTUNITY for the expansion of a domestic industry, in the face of foreign competition, depends largely on the difference between the foreign value of imported merchandise and the price at which it is sold to the American consumer. Last year the Treasury Department and the Senate Finance Committee undertook a joint investigation. The appraiser of merchandise at the port of New York was instructed to report the facts in regard to the country of origin, foreign value, transportation and other charges, duty paid and total landed cost of sundry articles purchased in New York City by representatives of the Finance Committee.

The investigation was carried out in a businesslike manner. The itemized data of the landed cost were prepared from invoices and entries on file at the Customs Office. The articles, after purchase by a customer unknown to the retailer, were inspected at the appraiser's office and identified by the examiners who usually pass on such merchandise. The results, as set forth in a Senate committee print, offer convincing proof in these particular instances of the vast "spread" between foreign value and American retail price, between the total landed cost and the amount paid by the consumer.

The articles purchased included necessaries and luxuries. In the latter class we note the cost in the United States of what was presumably a string of imitation amber beads, made in Germany and valued there at 62 cents. Charges, including transportation, insurance and freight, amounted to 1.6 cents; duty, 12.4 cents—making a total landed cost in the United States of 76 cents. The necklace was purchased from Gimbel Bros., of New York, on June 6, 1922, the price being $12.50. This shows an increase in retail cost over landed price of 1,544 per cent!

The profits made by New York retailers on "pearls" are much more modest, to judge from statistics. A necklace of these was valued in France, the country of origin, at $12.25. Charges, including transportation, insurance and freight, aggregated 98 cents; duty, $4.28—making a total landed cost in the United States, including 75 cents for an American-made clasp, of $18.26. The article was purchased from B. Altman & Co., of New York, on May 31, 1922, the price being $150. In this instance the percentage of retail price to landed cost was a paltry 757 per cent!

These facts should spur the efforts of American inventors and technicians who realize that a demand exists here for imitation gewgaws of all types. The labor cost to make beads and artificial jewelry is not great. The problem is one rather of the application of the science of glassmaking and the mechanics of production. At present the only persons in the United States who seem to be benefiting from the demand are the retailers.

White Tiles In Black Places

CLEANLINESS may be next to godliness—yet someone has said that in the average chemical plant it is often "next to impossible." We were inclined to that view ourselves until the other day we had the pleasure of going through the byproduct house of a modern coke-oven plant in a large Middle Western city. The things that impressed us most were that the walls were tiled in white and both the floors and the walls were actually clean. Now a byproduct house is generally far from inviting, for the manufacture of ammonium sulphate is ordinarily accompanied by rather dirty conditions. But things were different in this case. The white tiles not only improved lighting conditions tremendously but they seemed to establish a high standard of cleanliness—and the management had lived up to this standard.

But, you may ask, is it not an added burden rather than a help to management to be compelled to maintain this state of affairs? If you think so, perhaps you have not taken into account the psychological effect of such surroundings. Is it not a fact that men when forced to be clean about their work will also be careful? And we should not forget that particularly in the chemical plant the careful operator is the jewel of greatest price.

There is a thought here that all of us might well keep in mind: Make the men clean up the drip or sludge under the machines and wash the splatters off the walls. Their self-respect and consequently the quality of their work will be improved in the process, and you, Mr. Manager, will realize dividends in an easier and more profitably operated plant.

Opportunities for The Inventive Mind

ON BEHALF of the British Institute of Patentees Sir WILLIAM BELL has recently made public a list of suggestions embracing the major inventions most needed by the world. A glance through this comprehensive compilation brings home with fresh emphasis the important rôle of the chemical engineer. Of a dozen problems which one reviewer has selected at random from this list, more than half may be said to lie within the fields of chemistry and engineering. Nor could any one of them be approached intelligently without a fair appreciation of the principles of these sciences. A bendable glass, a flannel fabric that will not shrink, a road-surfacing material that will not be slippery even when wet, an efficient heating furnace—these are but a few of the problems awaiting solution.

It is not our purpose to glorify the chemical engineer unduly or to magnify the importance of his work as it relates to his fellow men. His responsibilities to progress are admittedly large; the present list is but a confirmation of this fact. It merely catalogs a few of the opportunities awaiting evolution into reality by the creative minds of our profession.

The Significance of Industrial Hydrogen

AN EDITORIAL INTERVIEW WITH DR. H. S. TAYLOR OF PRINCETON UNIVERSITY

THREE great fields for industrial hydrogen are aëronautics, hydrogenation processes and nitrogen fixation—i.e., synthetic ammonia.

If dirigible airships come into general use, it is scarcely likely that they will be lifted by helium except in war time. They may be partly lifted by it by inclosing an inner bag of hydrogen in an envelope of helium, but the principal lifting medium will probably be hydrogen. A modern dirigible airship requires two and three quarter million cubic feet of gas, which is the contents of a very large municipal gasometer. Hydrogen becomes explosive in a mixture with helium when the concentration reaches 15 per cent.

Hydrogenation processes also call for large volumes of the gas. Professor TAYLOR has spoken of a single factory that daily consumes over 800,000 cubic feet of hydrogen.

Fixation of nitrogen bids fair to demand the largest supply when once the synthesis of ammonia is properly mastered. To produce one short ton of ammonia requires 80,000 cubic feet of hydrogen. To multiply the entire number of tons of ammonia needed for fertilizer by 80,000 gives one a notion of the tremendous volume of hydrogen needed for this purpose alone.

The processes available for producing hydrogen are five: (1) The steam-iron contact process. (2) Water-gas catalytic process, in which water gas—i.e., hydrogen and CO—pass with steam over a catalyst at 500 deg. C., giving hydrogen and carbon dioxide. (3) Liquefaction, in which the CO of water gas is liquefied, freeing the hydrogen. (4) Electrolytic decomposition of water. (5) Thermal decomposition of hydrocarbons.

We cannot say that any one process is the best. In water-gas catalysis, for instance, there is a remnant of about 4 per cent of nitrogen that persists as a mixture and cannot be economically removed in the present state of the art. This is of no consequence in ammonia synthesis, because nitrogen is one of the reacting substances and more must be added. But in the hydrogenation of oils it is a diluent, and a very troublesome one at that. So the cheapness of water-gas catalysis hydrogen must be discounted in hydrogenation.

Electrolysis of water gives us the purest hydrogen, but it is also expensive unless the producer has a good market for the oxygen that is made with it. One large hydrogenating works began with the steam-iron catalytic process, but, finding a market for oxygen, has gone over very profitably to the purer hydrogen from electrolysis of water.

The thermal decomposition of hydrocarbons, the process described in the three articles by E. R. WEAVER of the Bureau of Standards which are now appearing in *Chem. & Met.*, has not been employed to a large extent thus far in the hydrogen industry. Among the principal difficulties has been the high temperature required for the complete decomposition of the more stable compounds such as CH_4 which are always produced in cracking and which unless removed become troublesome inerts or diluents. Mr. WEAVER'S work promises to solve the problem. Another difficulty, mentioned in the paper, is the production of carbon monoxide due to oxidation-reduction reactions which occur in the cycle. This is minimized by attention to the purity of materials used in construction of the equipment, the absence of iron and the elimination of moisture and oxygen from the oils used. Mr. WEAVER'S contribution is pioneer work of leading importance, but it may be said that all the other hydrogen processes need the same kind of intensive study. Each of the other systems should yield improvements under such research, and until this is done it is scarcely fair to make comparisons. It is the opinion of Professor TAYLOR that the steam-iron contact process is a very promising field for such investigation and that it could be improved materially in output of hydrogen per unit of raw material (coke and steam) and in the engineering features of the layout. There has been little improvement over the original unit built by HOWARD LANE in England early in this century. The German modification of the Lane process which substitutes one retort for thirty-six has been introduced, and economies are claimed for it, but putting thirty-six retorts into one is scarcely a radical change, and the economic difference between the two types cannot be great. What is needed in this case is fundamental study and then the creation of new designs.

It is encouraging, however, to be able to record the results of fundamental study in at least one of the five important processes for hydrogen production. Only when similar data are available for each of the other systems will it be possible to show which of the methods will be of the greatest significance in the large-scale production of this gas so essential to war- and peace-time industry.

Dr. Hugh Stott Taylor, whose views on the industrial significance of hydrogen are reflected in this interview, is professor of physical chemistry at Princeton University. He is an Englishman, born in Lancashire in 1890, and a former student of Arrhenius at the Nobel Institute, Stockholm. Later he studied at the Technische Institut at Hanover and at the University of Liverpool. In 1914 he came to Princeton, where, except during his war activities, he has been ever since. Of late he has been addressing himself in research to catalysis and more particularly to the adsorption of gases by catalytic agents. All cases of contact catalysis, he believes, are preceded by an association of the reacting substances with the contact catalyst. This adsorption is just as specific as catalysis. Dr. Benton of Princeton has shown, for example, that CO can be oxidized in a mixture of 1 part in 99 of H_2. The reason is that while the relation of H_2 to CO is as 99:1, the concentration of gases on the surface of the catalyst is almost wholly CO, with no H_2. "The CO oxidizes first because the H_2 doesn't get a look-in," says Professor Taylor.

Route Your Materials Via Air Line

By F. L. Jorgensen
President, Dust Recovery & Conveying Co. Cleveland, Ohio

A short study of the art of pneumatic conveying. Classification of the various systems in use. Examples of successful installations. How abrasives are handled.

AN AIR LINE LIME CONVEYOR

PNEUMATIC material conveying has been in use for a considerable time. Although until recently only a few materials have been successfully handled, engineering progress in the last few years has increased the field of this method and made it an important factor in the material-handling world. In this article, brief mention will be made of the various systems of pneumatic conveying in use and many examples will be given of installations in various fields, installations that have solved labor difficulties, cut costs and improved conditions generally.

Pneumatic conveying systems naturally fall into two main classifications—the pressure or blowing system and the vacuum or suction system. In recent years the vacuum system, into which classification most of the examples cited here fall, has taken the lead.

The two main classifications mentioned above have three subdivisions each, depending on the pressure under which the system operates. Thus the completed classification is: Vacuum systems—low, medium and high; pressure systems—low, medium and high.

Of the above, the low-pressure or the low-vacuum system is, with few exceptions, exclusively used in dust-collecting work and is mentioned here only to make the outline complete. These systems are in some cases used for conveying sawdust, shavings, wool, feathers and similar lightweight materials. The systems work generally with a pressure or vacuum of 6 to 10 in. of water. A comparatively large air volume is required, ranging from 30 to 70 cu.ft. of air per pound of material handled, depending on the nature and weight of the material and the distance over which it must be conveyed. Fans are used for this work.

FIG. 1—LAYOUT OF HIGH-PRESSURE CONVEYING SYSTEM

The medium-pressure and medium-vacuum systems have been used extensively for many years, especially for handling grain and similar materials. These systems have successfully solved many handling problems of this nature. Rotary blowers or vacuum pumps supply the energy and 4 to 10 in. of mercury is the pressure or vacuum used. In general design these systems resemble the high-pressure and high-vacuum systems. However, as they use a larger volume of air, they also use larger pipe lines and collecting stations than do the high systems. From 3 to 10 cu.ft. of air per pound of material handled is required, depending on the nature and weight of material handled and the distance which the material is conveyed. They will handle, however, the same materials as the high systems, subject to certain disadvantages which will be pointed out later.

The High-Pressure System

As stated above, pneumatic conveying has been used for years for handling materials that had little or no dust in them, such as grain, and where it was immaterial if part of the dust were discharged with the air. This was because there had been no efficient dust-collecting plant as yet developed. Now such equipment has been perfected and the field of pneumatic conveying has thus been enormously enlarged.

In so far as equipment is concerned, this high-pressure system is the simplest of all. It consists of a high-pressure blower, a pipe line and a collector. The material can be fed into the pipe line either through a specially designed feeder or through an ejector. When materials containing little or no dust such as grain, wood chips, whole pepper or the like are handled, the material can simply be blown through the pipe line into a cyclone or directly into a bin or warehouse. This is illustrated on the right-hand side of Fig. 1.

Where, however, dusty materials such as soda ash, plaster of paris, cement, etc., are conveyed, the equipment must include in addition an air filter to prevent the dust being carried away with the escaping air, thus eliminating waste and nuisance. This is shown on the left side of Fig. 1.

The use of this pressure system is in practice generally limited to problems where the material to be conveyed can be fed into fixed receiving stations at stationary points, and the rapidly increasing use of pneumatic conveying in late years has mainly been due to the suction system. With this system, because a flexible feeding hose can be used and pipe lines can be

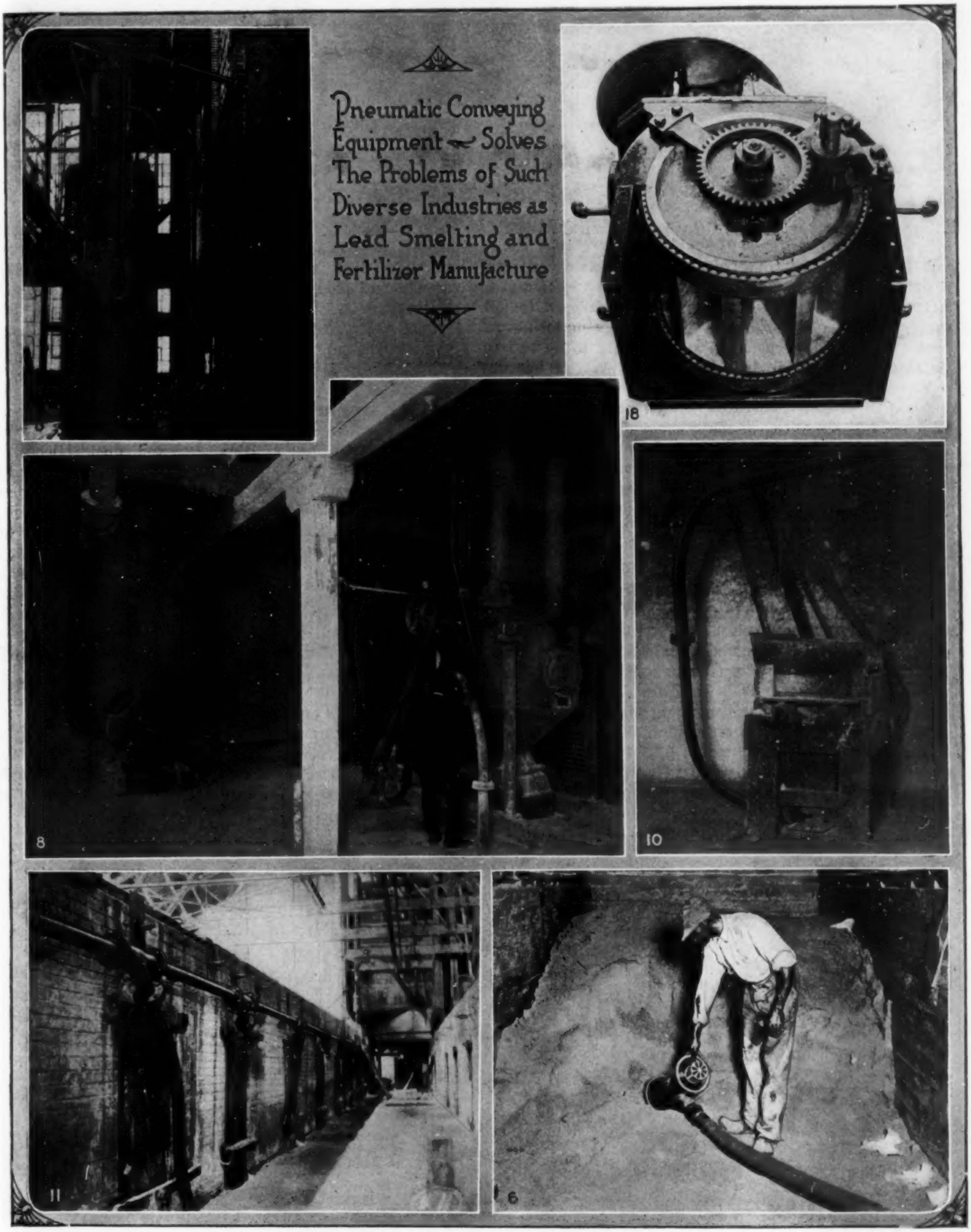

Fig. 3—View of equipment for handling lead. Fig. 18—Rotary discharge lock. Fig. 8—Collecting station. Lithopone-conveying equipment. Fig. 10—Intake at lithopone crusher. Fig. 11—System for handling dust from settling chambers. Fig. 6—Unloading a car of fertilizer. (Note the relatively clean conditions and absence of dust.)

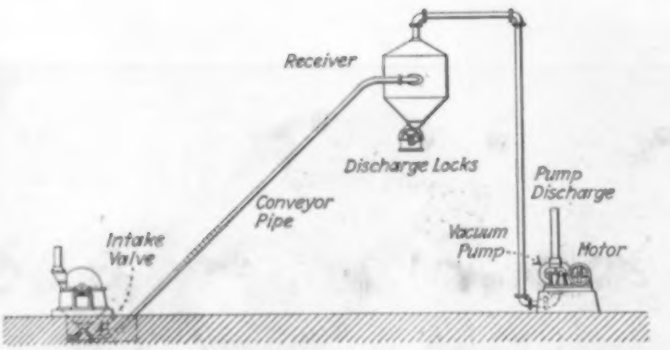

FIG. 2—LAYOUT OF HIGH-VACUUM CONVEYING SYSTEM

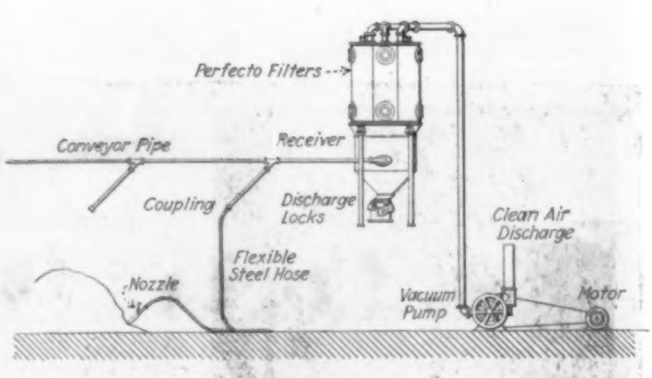

FIG. 5—LAYOUT OF SYSTEM WITH DUST FILTRATION

run from the same collecting station to various points, a greater flexibility and hence adaptability is attained.

During the war it became extremely difficult to get material for sacks. For this reason such materials as cement, soda ash, gypsum, lime, etc., very often had to be shipped in bulk in box cars. This practice has developed from an emergency measure to a common method of shipment because of the economy which it effects. But shipping in this manner does make it hard to unload the cars by the methods formerly in use. The need for an economical unloading device is met, however, by the pneumatic conveying system and today this use of the equipment is the field in which it is most employed.

When mentioning the subject of car unloading, we at the same time strike the essential difference in the adaptability of the medium-vacuum system in comparison with the high-vacuum system. With the medium-vacuum system an air volume of from 3 to 10 cu.ft. per pound of material is required with vacuum at 4 to 10 in. Hg. This necessitates (to make a concrete illustration) using a 10-in. pipe and suction hose for unloading 20 tons per hour from a car conveying material a distance of, say, 150 ft., using an air volume of 4,000 cu.ft. per minute and with a vacuum of 8 to 10 in. Hg; while under the same conditions and with the same capacity and distance, the high-vacuum system would require only 1,600 cu.ft. of air per minute at 16 to 17 in. Hg vacuum and only a 4-in. conveying pipe and hose. It will be very easy for everybody to understand the difference between handling a 10-in. heavy suction hose in a car in comparison with a 4-in. hose; the difference being that the one is nearly impossible and the other is practical. This and the dust-collecting efficiency explain the success of pneumatic conveying in late years.

What applies to hose, of course, also applies to pipe lines and size of collecting station and dust collectors; and it will be apparent that a small pipe line is easier to put up almost anywhere than a large cumbersome line. The high velocity and vacuum used have made it feasible to convey the heaviest known materials as well as the lightest; and this system is actually handling such materials as metallic lead from atomizers, which weigh from 450 to 500 lb. per cu.ft.; and such materials as talcum powder, carbon black and powdered coal.

Fig. 2 shows the outlines of a typical pneumatic conveying installation of the simplest form and will illustrate the system as this has been used for many years. It consists simply of a vacuum pump, pipe line and receiver in which the material is precipitated. This equipment in modern practice would be used only on materials free from dust, as dust will not all settle in the receiver, but pass on and be discharged through the pump. This equipment as well as the following

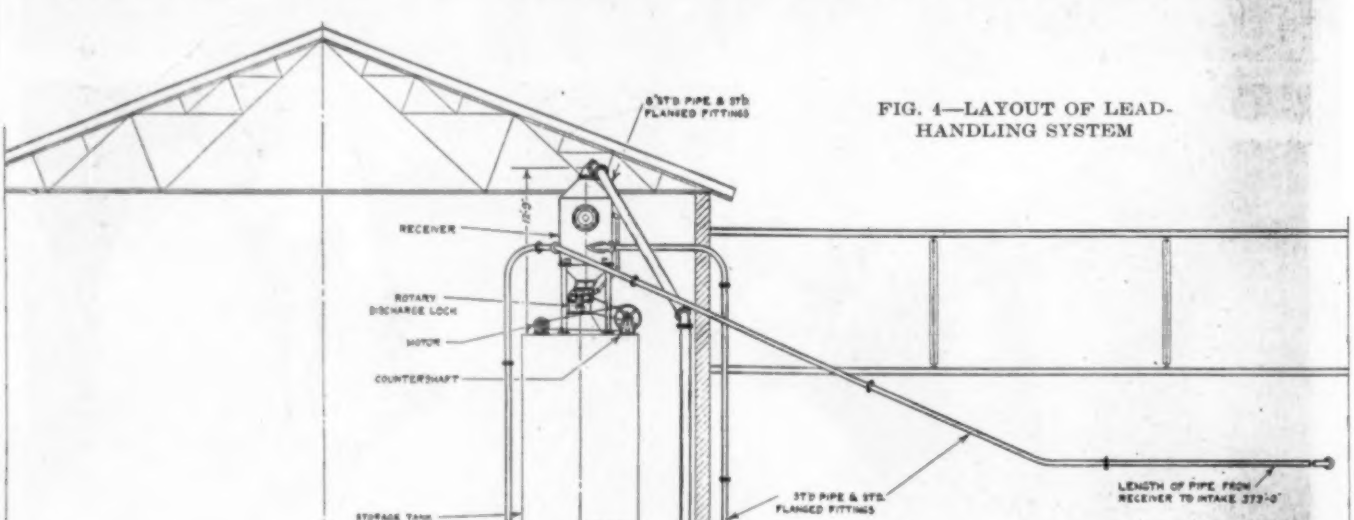

FIG. 4—LAYOUT OF LEAD-HANDLING SYSTEM

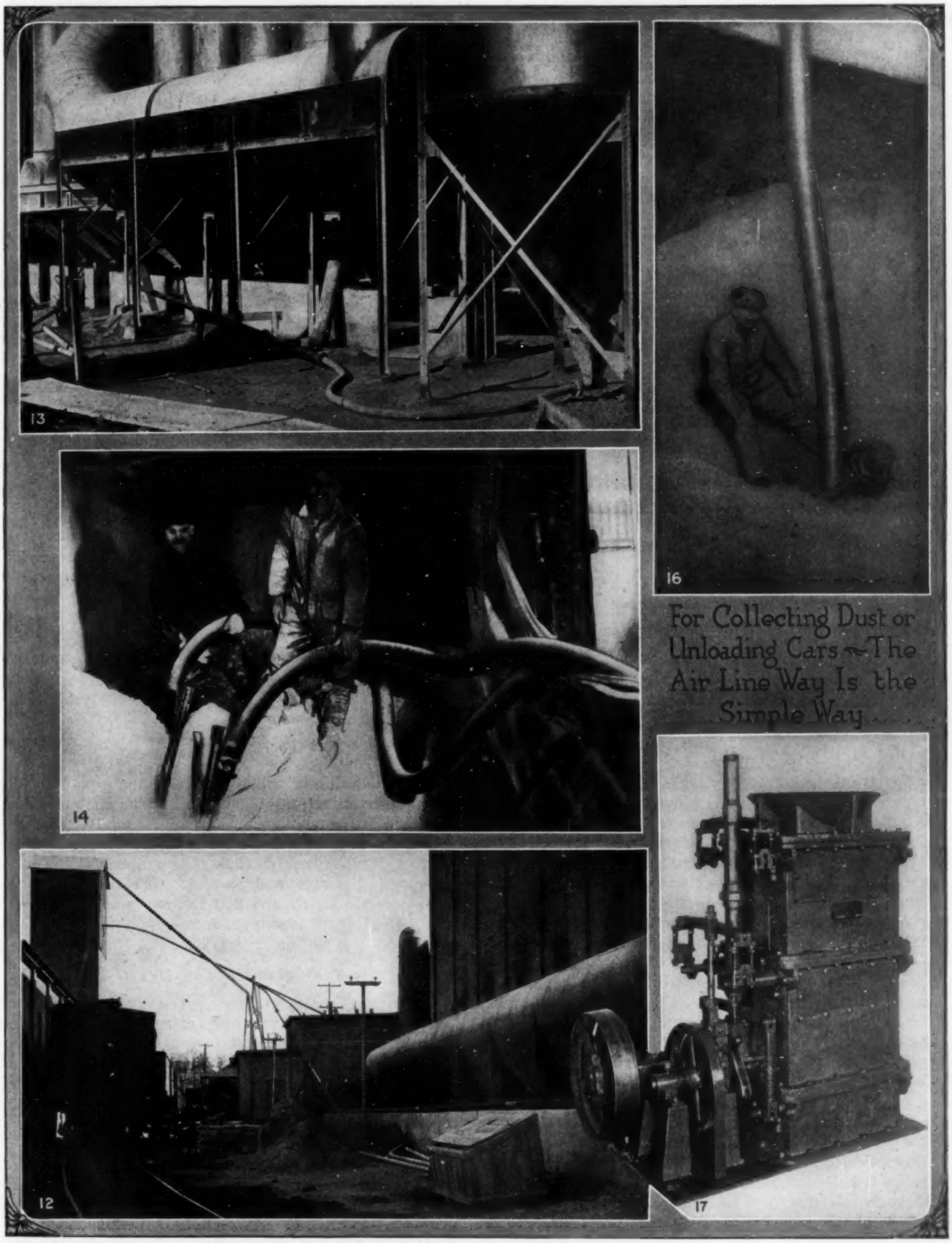

Fig. 13—Conveyor for dust from precipitators. Fig. 14—Unloading bauxite. Fig. 12—System for recovery of flue dust. Fig. 16—Unloading pebble phosphate. Fig. 17—Three-valve discharge lock.

described installation can of course be used as well with the medium- as the high-vacuum system. It is only to be borne in mind that the comparative size, for same capacities, will be different, as the high-vacuum system will allow all parts to be considerably smaller.

A typical installation on this order is shown in Figs. 3 and 4. This installation was designed for high-vacuum and conveyed 10 tons per hour of atomized metallic lead from atomizers to storage bins through a 2½-in. pipe. This type of equipment, however, has its widest field in grain handling and when the large elevators or dock legs get to the bottom of the present large tonnage steamers, a 3- to 4-in. flexible suction hose for cleaning up at the rate of 10 to 20 tons per hour saves time and labor. Fig. 4 also serves to illustrate how much space is saved by such an installation in comparison with the corresponding equipment of belt or other mechanical conveyors. This type of application is also ideal for handling material from small boats or for transferring from barges to steamers and *vice versa*. When this method is once fully understood in the shipping world, the demand for such pneumatic conveying equipment will be enormous.

We have previously indicated the quickly increasing demand for equipment for handling dusty materials, either from one place to another in a factory where conditions will not allow any other means, for unloading cars, and for handling poisonous or for other irritating materials. It has been the development of the high-vacuum system with the required small air volume and the perfected dust-collecting equipment which has made it possible to satisfy this demand. In Fig. 5 is shown the general outline of such a system. It is the same in every way as the equipment described immediately above, but automatic self-cleaning dust filters are placed on the top of the receiver and the air when leaving the receiver is filtered in the filter compartments shown. The dust is retained by the filters and periodically and automatically is shaken back into the receiver and discharged with the material through the discharge lock, while the air that now is clean passes on to the pump.

One of the most difficult labor problems, in the fertilizer industry and also in other places, consists in handling disagreeable and dusty materials. Men do not generally care for such work and the resulting labor turnover often assumes serious proportions. Among materials the handling of which is attended by such difficulties, we might mention fertilizer materials like tankage, phosphate, dried blood and bone meal. Materials in other industries include lime, cement, calcium arsenate, salt cake, etc.

In handling this type of material pneumatically the labor problem is mostly solved, for the method does away with the dust problem and its consequences in disagreeable working conditions. In Fig. 6 we see a worker unloading a car of such material. Note how clear the atmosphere is of dust in comparison with the results obtained by hand methods.

In Fig. 7 the layout of such an installation is given, the design being arranged for the unloading of three cars at once. By a multiplication of the 3-in. pipe lines shown, even more cars can be unloaded at once and switching is eliminated. In this particular layout the material from the cars is discharged into an industrial railway for distribution throughout the plant, as the elevation at the right of Fig. 7 shows.

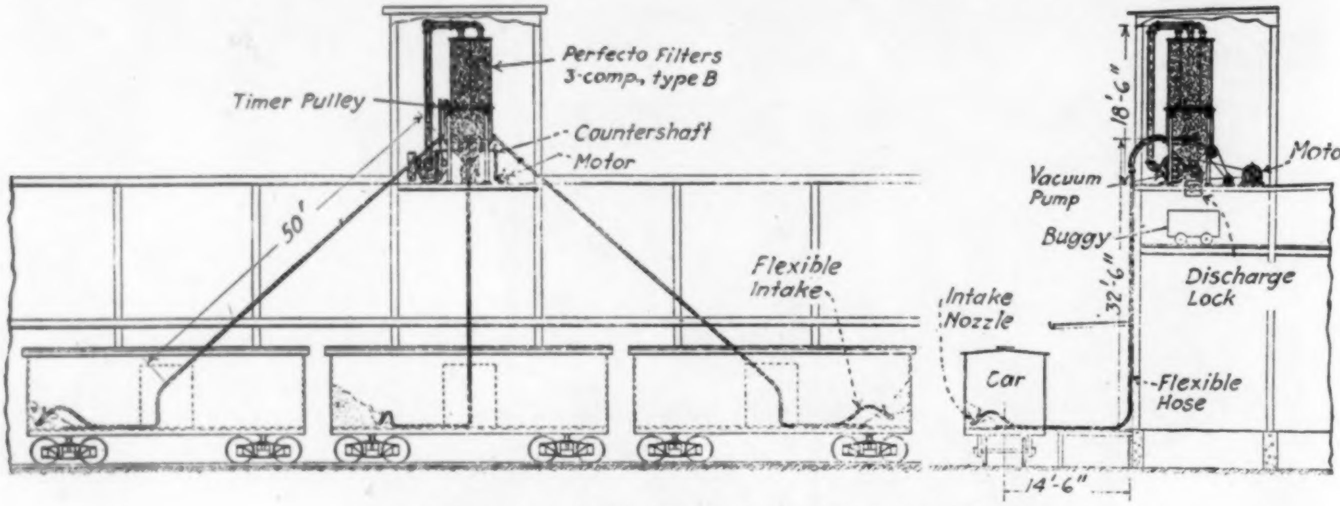

FIG. 7—LAYOUT OF CAR-UNLOADING SYSTEM FOR FERTILIZER

An installation in which the conveying pipe lines run in opposite directions is shown in plan and elevation in Fig. 9. The photographs, Figs. 8 and 10, show, respectively, the collecting station and the intake at the crusher for this equipment. The material handled is lithopone, in lumps and powder. The pipe lines are, respectively, 125 ft. and 250 ft. long and they convey approximately 3 tons per hour simultaneously from each receiving station or intake.

Air Transportation in Metallurgy

There has recently developed a great interest in pneumatic conveying in many branches of metallurgical industry. This has been accelerated by the pronounced labor shortage in this field. Several installations along this line are now being made for handling arsenic recovered from smelters, dust from powdered coal in annealing furnaces, dust from checkerwork in steel plants and other uses.

Fig. 11 shows one of these installations. Here a suction line runs along in front of the settling chambers of a smelter, over the doors. At each door is a Y connection. To these connections a flexible hose with suction nozzle can be attached wherever desired, and the settled material from within the chamber recovered.

Figs. 12 and 13 give us two views of an installation at a smelter used for similar purposes. Fig. 12 shows the main run for recovering dust from the flue and the

pipe lines to the tower in which are the collecting station and the bin. Fig. 13 shows the method of conveying the recovered material from the dust filters.

Figs. 14 and 15 show a photograph and the layout of an installation for unloading aluminum ore. In the photograph two men are seen unloading a car with two 3-in. flexible suction lines. The installation has a capacity of 20 tons per hour. This quantity, drawn out of the cars through two 3-in. hose, is elevated a little over 70 ft., with a horizontal conveying distance of about 50 ft. Each 3-in. hose pulls a little over 10 tons per hour; and, while one 4-in. hose would do this work, it is found easier to handle the two 3-in. hose than the one 4-in. hose. To make clear where a hose larger than 3 in. can be used to advantage, Fig. 16 is shown. Here a 4-in. hose is operating in the hold of a boat and the weight is so carried from above that the difficulty of manipulation is reduced. On the installation shown in this picture 30 tons of pebble phosphate per hour is discharged from the boat into cars on the wharf.

Many times objections have been raised to pneumatic conveying because of the high horsepower it requires when compared with such equipment as belt conveyors, screw conveyors and bucket elevators. It is not the writer's object even to suggest that pneumatic conveying will ever replace other conveying means where it is possible to operate these. However, there are to be found an unlimited number of places and conditions or applications where no other conveying system but the pneumatic can be used. For instance, one of these is shown in the headpiece. This photograph shows a 2½-in. pipe line hanging on a wire rope and passing clear over a manufacturing plant of large proportions, said pipe line being 450 ft. long. Through this pipe line is conveyed night and day more than 3 tons of lime per hour which has to be passed on from one manufacturing process to another in a steady stream.

New problems are constantly coming up and are being solved; and the writer is of the firm opinion that, from month to month, considerable material can be added to the short outline given above. There is one more point to be mentioned before we close. Within the past 6 months a development has been made which opens the field of abrasive handling wide to the pneumatic conveyor, a thing which many past attempts have failed to accomplish. The reason why abrasive materials could not be handled before by pneumatic conveying was the excessive wear on the discharge locks rather than the wear on the pipe lines and hose. Six months ago, however, a new discharge lock was invented which

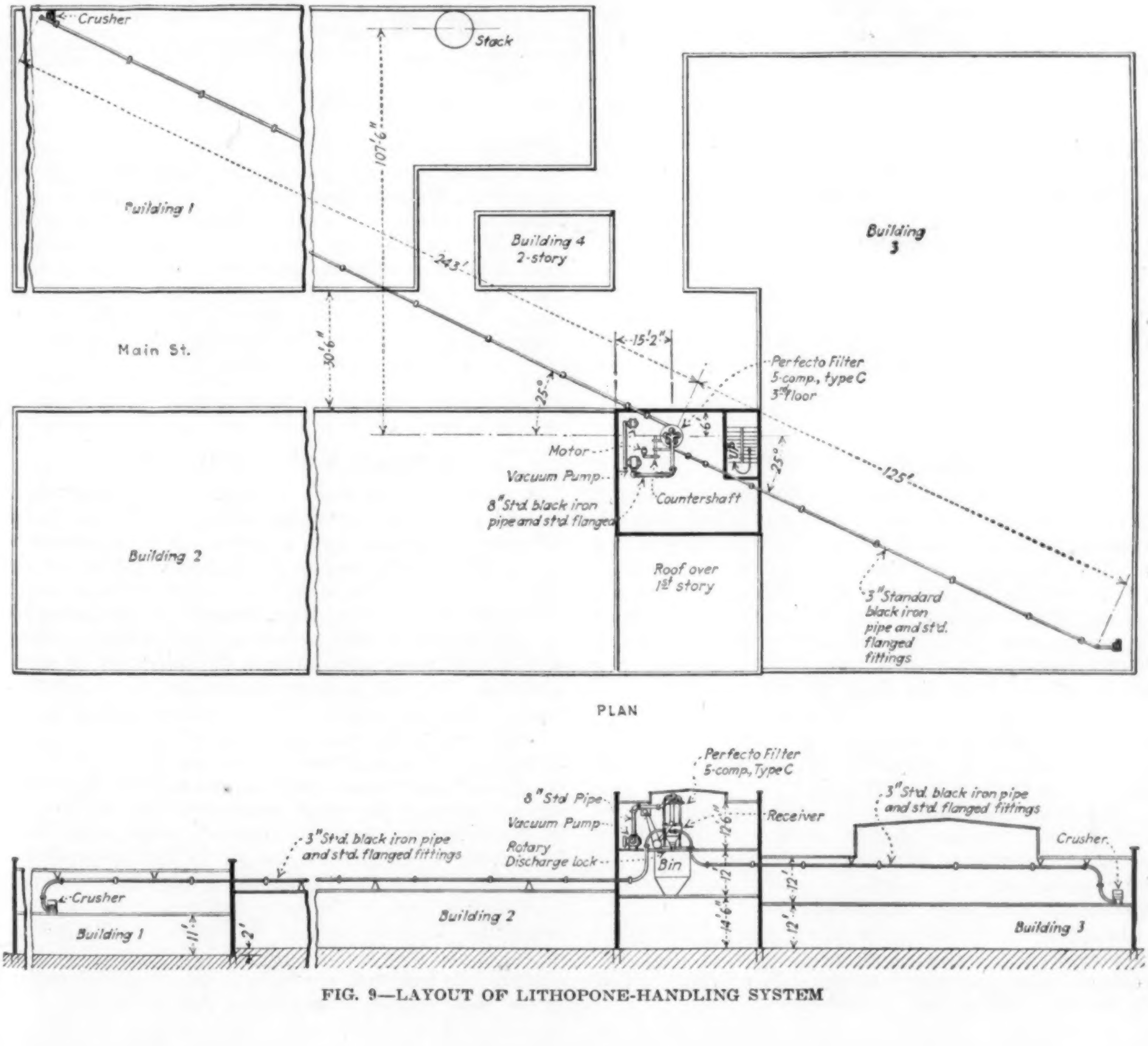

FIG. 9—LAYOUT OF LITHOPONE-HANDLING SYSTEM

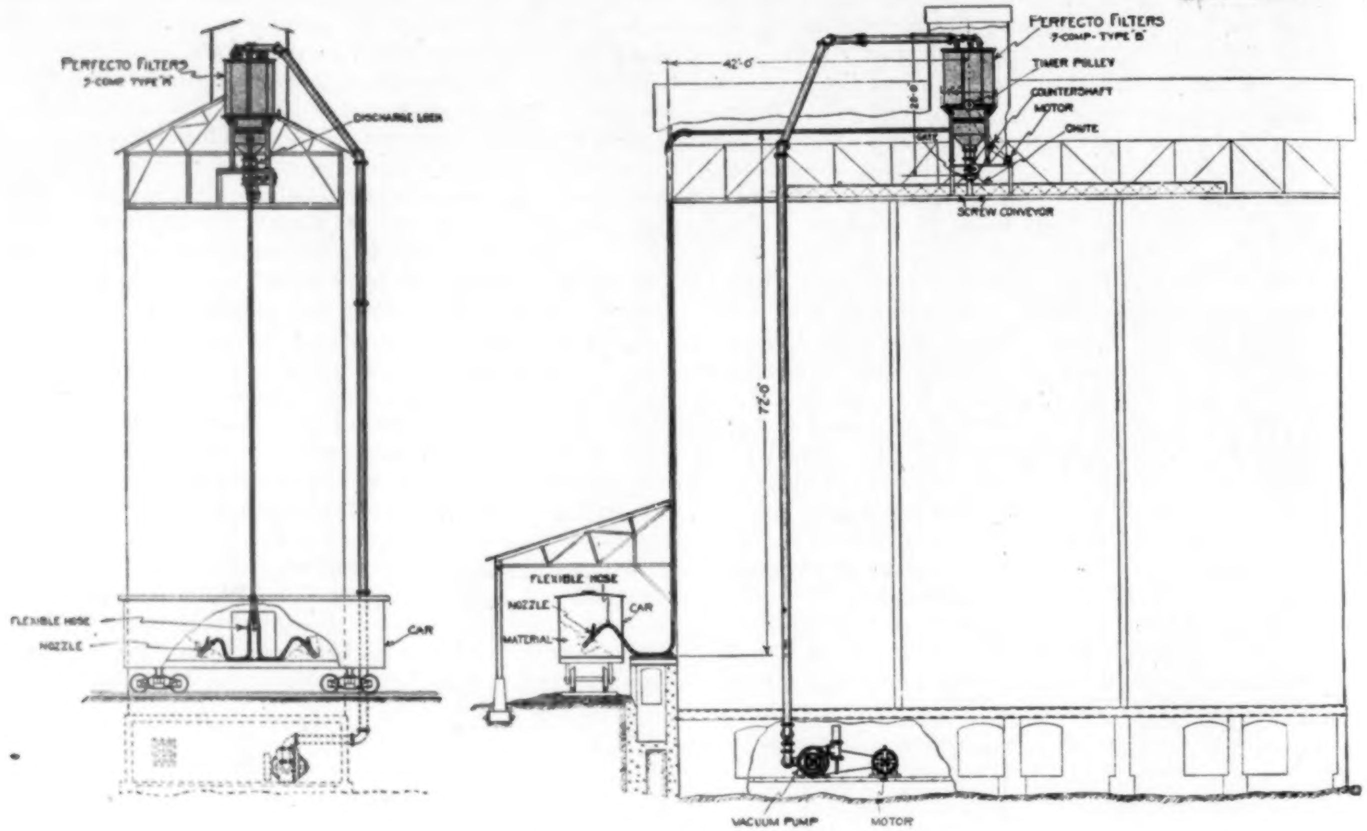

FIG. 15—BAUXITE-HANDLING SYSTEM LAYOUT

without any trace of wear is handling the most abrasive materials known. Fig. 17 shows this lock, which is called a three-valve discharge lock; while Fig. 18 shows the rotary lock, which has been the standard unloading lock in the past and which is successfully handling all non-abrasive materials.

The installation shown in Figs. 14 and 15 has handled many hundred tons of bauxite concentrates, a material of an extremely abrasive nature, through this so-called three-valve lock; and, while the said material will wear out a screw conveyor in 3 weeks' time and a rotary discharge lock in less time than that, a three-valve lock has now been running for months on this material without any wear whatever. Great progress has also been made in the materials used for suction hose, and on this same installation the conveying hose and pipe lines show only insignificant wear; it, of course, being a fact that material at a high velocity travels at the center of the pipe lines and only strikes the pipe when the bends are sharp.

Chloridizing Silver Ores

Tests conducted at Western stations of the Bureau of Mines have shown that the roasting of silver minerals tends to produce metallic silver. Chloridizing roasting of silver minerals, therefore, is essentially a problem of chloridizing metalic silver and subsequent volatilization of silver chloride. In the furnace, conditions must be maintained that prevent the silver from being hydrolyzed and from reverting to the metallic state before passing from the ore as silver chloride.

Silver is not easily chloridized and volatilized, and has so far offered greater difficulty than any of the common metals. It seems extremely sensitive to atmospheric conditions in the furnace.

Silver minerals occur in many low-grade and complex ores of lead, zinc and copper, silver sometimes being of major importance, especially in economic value. A high percentage extraction is required to make any process for such ores commercially feasible.

In many ores the silver has minor value. When silver is present with rather high percentages of lead and copper, it may not seem economical to provide the conditions for making high extractions.

Salvages in the Oil Industry

A study is to be made by the Interior Department of salvages in the petroleum industry, with particular reference to production activities. The investigative work will be performed by C. P. Bowie, petroleum engineer, of the Bureau of Mines. Large sums of money are spent annually by oil companies in the purchase of new equipment such as casing, sucker rods, drilling and fishing tools, engines and the hundreds of other essentials that go to make up equipment for oil field work. This new material often replaces used or partly damaged equipment that many times is consigned to the scrap heap without proper thought as to the possibility of it being worked over or repaired and put back into service or made to serve some other useful purpose in the industry. Some of the larger companies have been doing a considerable amount of salvage work for a number of years and a few have departments whose particular object is the care and repair of salvaged materials. Careful study of the subject by the Bureau of Mines and dissemination of the information obtained should, it is believed, result in a very material saving to the many smaller oil-producing companies.

Production of Hydrogen By the Thermal Decomposition of Oil

Discussion of the Purity of the Gas Obtained in the Experimental Manufacture of Hydrogen for Government Air Services—Carbon Monoxide the Principal Impurity—Suggested Means for Eliminating It—Thermal Balance of Process

BY E. R. WEAVER,
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IT IS the purpose of the present article to give only the more interesting data showing the variations in the composition of the gas obtained during the various runs of the plant.* In Table I data are shown for each of the runs for which purity curves have been prepared. The table is self-explanatory with the exception of the temperature data, which represent temperatures observed shortly before the beginning of the corresponding runs.[1] A blank under generator-temperature indicates that no reliable temperature reading was obtained in the generator before the beginning of the run because of the presence of smoke. There can be no doubt that the maximum temperatures existing in the plant were higher than those observed: just how much higher it is difficult to estimate. The condition of the refractories in the vaporizer after the experiments indicated that the temperature at the bottom of the checker-brick column had been at least 100 deg. C. hotter than the maximum observed at the lowest sight cock.

PURITY OF HYDROGEN

Characteristic curves representing the variation of purity of the hydrogen produced during any run in which the rate of production remained approximately constant are shown in Figs. 4 and 5. All the purity curves obtained were similar in form to these; it can be readily seen that each of the more complex curves of Figs. 6 to 13 is composed of segments of the general shape of the curves in Figs. 4 and 5. Each such segment represents a period during which the conditions of production were not materially changed.

The three curves of Fig. 4 are typical of production at a low and fairly uniform rate. Although the maximum observed temperatures were rather high, especially in run 24, they were probably not well distributed and the poor yields and low purity are to be ascribed to temperatures too low to decompose methane successfully.

The various impurities are separated in Fig. 5, which represents a run made at high temperature with an oil feed of 1 gal. per minute. The impurities were determined in this case by volumetric analysis, and the irregularities were caused by the unavoidable variations in oil flow resulting from irregular air pressure in the supply tank. It is noteworthy that the carbon monoxide, always greatly in excess of the nitrogen, approaches a constant quantity, while the methane, which is negligible during the first half hour, increases rapidly toward the end of the run.

ELIMINATION OF METHANE

At the beginning of the investigation it was expected that the troublesome problem would be the elimination of methane. Such did not prove to be the case, however. The dominant impurity in all experiments was carbon monoxide. Nevertheless carbon monoxide is to be regarded as a more or less accidental impurity, the source and elimination of which will be discussed in the next section.

Figs. 6 and 7 show the results of a variation from the usual practice of vaporizing the oil on the checker brick. In these experiments the oil was run onto the coke and the vapors were passed from the generator through the checker-brick tower. It was hoped that this procedure would result in economy of time and fuel, because the carbon deposited in the coke bed could be burned more rapidly and efficiently than that deposited on the checkerwork.

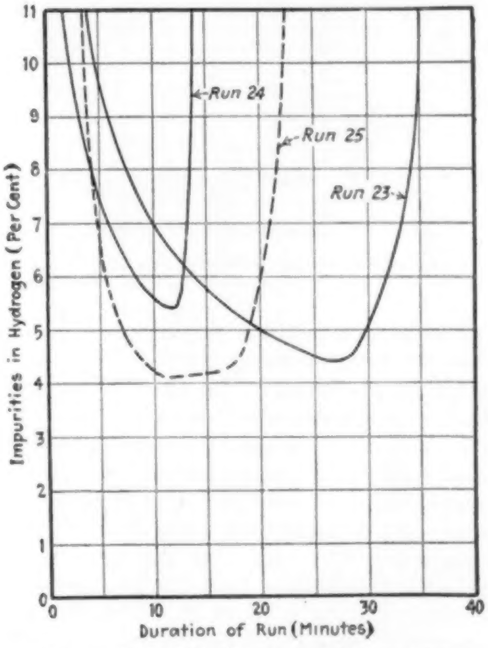

Fig. 4—Typical purity curves at low temperatures. Uniform oil-feed. Petroleum, coke and kerosene.

During portions of both runs the oil vapor was passed directly from the top of the coke bed to the

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*EDITOR'S NOTE: This is second in a series of three articles describing experiments carried out with the modified water-gas plant of the Gas Engineering Co., Trenton, N. J., for the purpose of obtaining a complete study of the process.

[1]Unless otherwise stated the oil was vaporized in the checker brick and passed through both the checker brick and the coke bed in all the experiments described.

checker-brick tower without passing through the body of the coke. This was done in order to determine the efficiency of the checker brick alone in producing hydrogen, with special reference to the possibility of dispensing with a coke fire and using an oil or gas fire as a source of heat. The results definitely prove that gas passed through the checker-brick tower alone contains several times as much methane as that passed through the hot coke. This was found to be the case in spite of the fact that the observed temperature of the checker brick was higher in run 26 than in any other experiment except runs 34 and 45.

No apparent advantage of any kind resulted from vaporization in the coke bed; and the latter was so clogged up by the deposited carbon that only short runs could be made. This factor more than offset any advantage which might have resulted from the more efficient utilization of the carbon produced during blasting.

The very poor results obtained when the checker brick

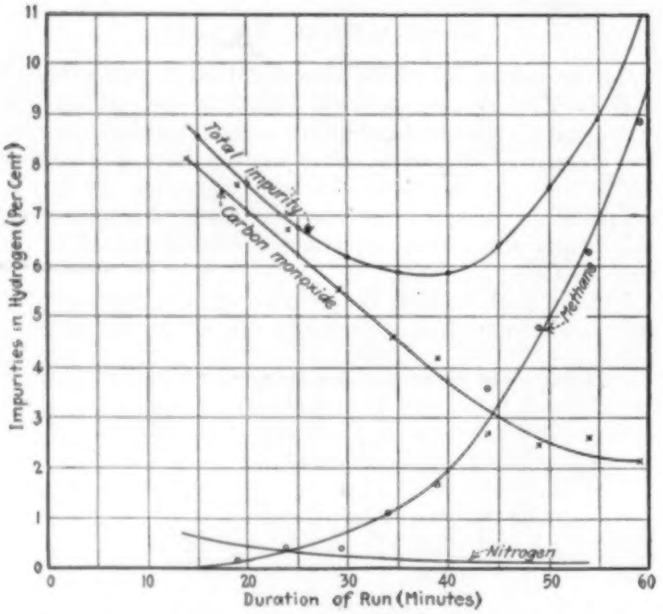


Fig. 5—Composition of gas produced in run 34 as determined by volumetric analysis.

alone was used as a heating surface were probably due as much to the lower temperature of the brick as to the smaller surface of contact. The effect of temperature is well shown by comparison between runs 35 and 36 (Fig. 8). The difference in the results obtained is to be ascribed entirely to the formation of methane at the lower temperatures of run 36. A still more instructive comparison may be made between runs 41, 42, 43 and 45. (Figs. 9 and 13.) Runs 41 and 42 were purposely made at low temperatures in order to study the effect of temperature. In run 43 the temperature of the checkerwork was about 200 deg. higher, and the effect on yield and purity is at once apparent. In run 45 a further increase in the temperature of the checkerwork gave still better results, although the apparent temperature of the coke was less than that in run 43. This and other similar observations show that the temperature of the checker brick is a much more important factor than might be assumed from the fact that the final elimination of methane must be accomplished in the coke bed. Indeed checker-brick temperature appears to be quite as important as coke temperature. It is probable that most of the endothemic reaction takes place in the

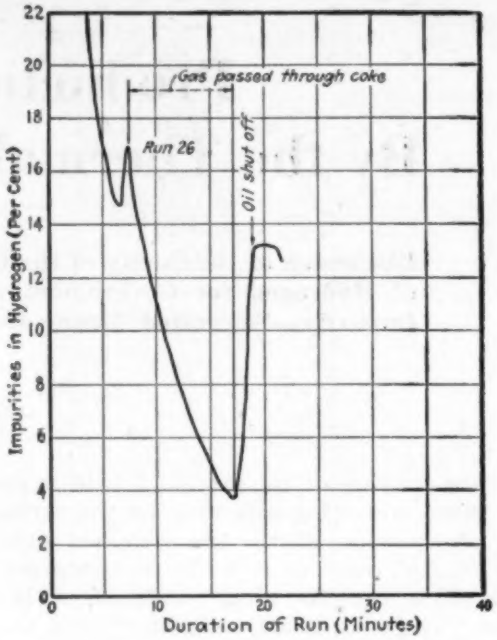


Fig. 6—Effect upon passage through coke upon removal of impurities. Rate: 1 gal. of oil per min.

TABLE I—GENERAL DATA REGARDING THE PRODUCING RUNS REPRESENTED BY FIGS. 4 TO 13

Run No.	Duration, Min.	Oil Used — Kind	Oil Used — Quantity, Gal.	Solid Fuel	Highest Observed Temp. Vaporizer, Deg. C.	Highest Observed Temp. Generator, Deg. C.	Hydrogen Produced, Cu.Ft.
23	35	Kerosene	19.8	Petroleum coke	1,440	1,460	2,864
24	14	Kerosene	16.4	Petroleum coke	1,380	1,565	2,279
25	23	Kerosene	20.2	Petroleum coke	1,360	.....	2,957
26	19	Kerosene	21.2	Petroleum coke	1,450	.....	3,318
27	27	Kerosene	14.6	Petroleum coke	1,285	.....	2,034
34	60	Kerosene	62.8	Petroleum coke	1,525	1,590	10,870
35	40	Fuel oil	48.8	Petroleum coke	1,400	1,565	8,137
36	15	Fuel oil	14.4	Petroleum coke	1,110	1,460	2,480
37	48	Fuel oil	80.0	Retort carbon	1,380	.....	12,119
38	46	Fuel oil	67.8	Retort carbon	1,370	.....	11,227
41	22	Fuel oil	33.2	Retort carbon	1,130	1,625	5,629
42	17	Fuel oil	25.2	Retort carbon	1,130	1,450	4,073
43	29	Fuel oil	51.8	Retort carbon	1,325	1,590	9,726
44	60	Kerosene	71.2	Retort carbon	.....	.....	11,717
45	45	Kerosene	73.0	Retort carbon	1,470	1,540	13,680

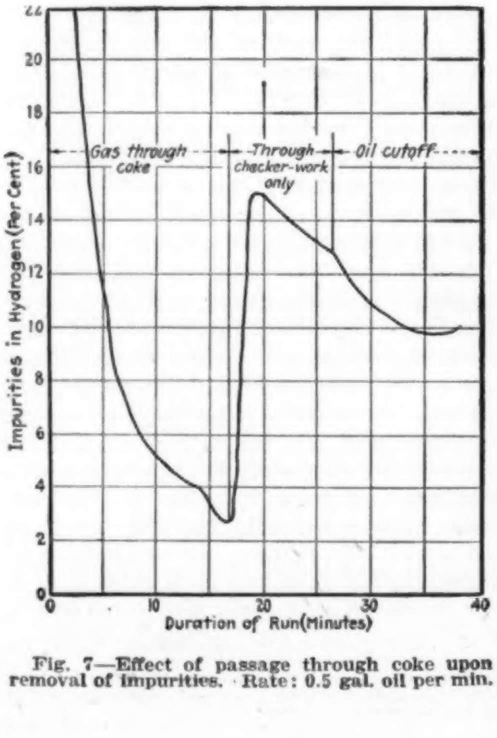


Fig. 7—Effect of passage through coke upon removal of impurities. Rate: 0.5 gal. oil per min.

checkerwork and that a relatively small decrease in efficiency there puts a much greater load on the coke. If, for example, 90 per cent of the endothermic reaction takes place in the checker brick, a decrease of 10 per cent in their efficiency would about double the amount of heat taken from the coke to complete the reaction. This relation is substantiated by the facts that the first hydrogen produced, even in the runs made at the lowest temperatures, was found to be nearly free from methane and that the initial temperature was observed to affect principally the amount of oil which can be used before an appreciable amount of methane appears.

The Source of Carbon Monoxide

The plant would have produced hydrogen of quite satisfactory purity from the start had it not been for the occurrence of considerable amounts of carbon monoxide. It is evident that any free oxygen in the system

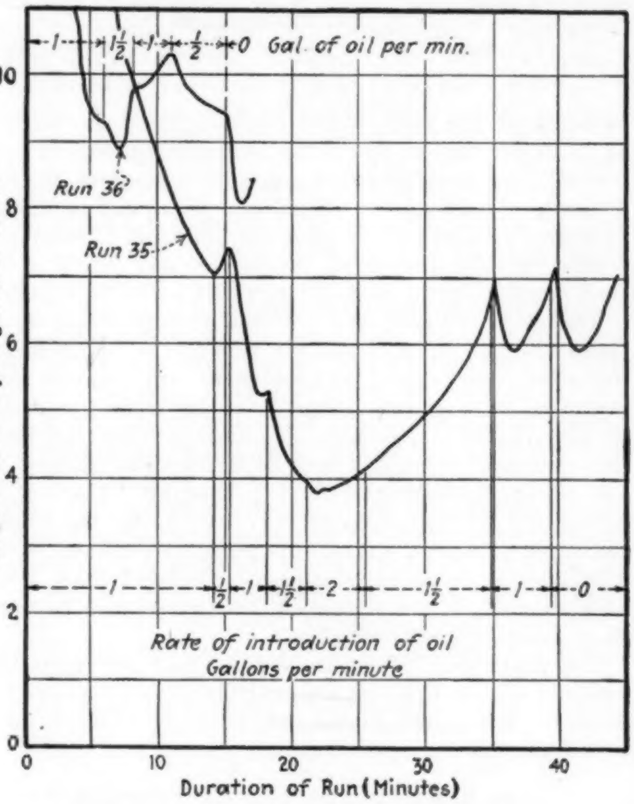


Fig. 8—Effect of temperature and rate of production on purity.

or oxygen in any compound which can be reduced by hydrogen or carbon at temperatures up to 1.600 deg. C will appear in the gas as carbon monoxide. The sources of the oxygen were ultimately determined with some certainty to be: (1) water vapor from the Silocel lining of the generator, and (2) oxides of iron present in the machine.

The source of this principal impurity (carbon monoxide) in the hydrogen is of so much importance that the reasons for the conclusions given will be stated in detail.

The principal possible sources of oxygen appear to be as follows: (1) Air remaining from the blast or included in coke or linings. (2) Water or organic compounds containing oxygen in the oil. (3) Water or organic compounds containing oxygen in the coke. (4) Any materials, notably iron, or iron oxides, which remain in any heated portion of the system and can be oxidized during blasting and reduced by hydrogen or

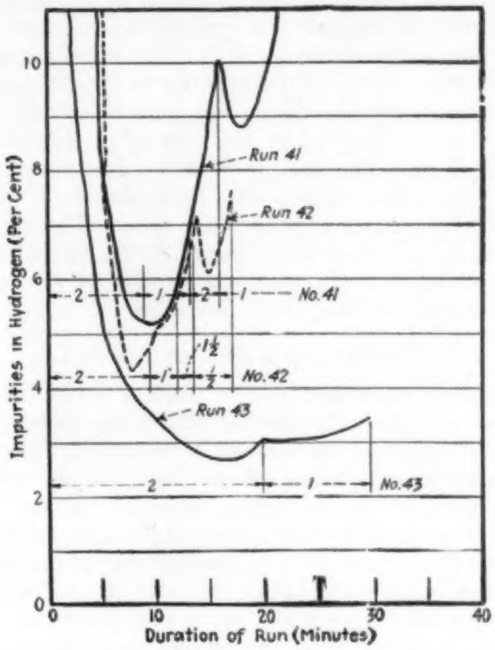


Fig. 9—Effect of temperature on production.

carbon during hydrogen production. (5) Water from a leak in the water-cooled valve between generator and checker-brick tower. (6) Water from the linings of the generator.

If the oxygen had come from air, each volume of carbon monoxide would have been accompanied by approximately twice its volume of nitrogen. On the contrary, the amount of nitrogen found was always very small after the first minute or two of the run, seldom amounting to more than 10 per cent of the carbon monoxide in the samples taken for volumetric analysis.

The rate was computed at which carbon monoxide was being produced at the time each volumetric analysis was made. It was assumed that the nitrogen present was

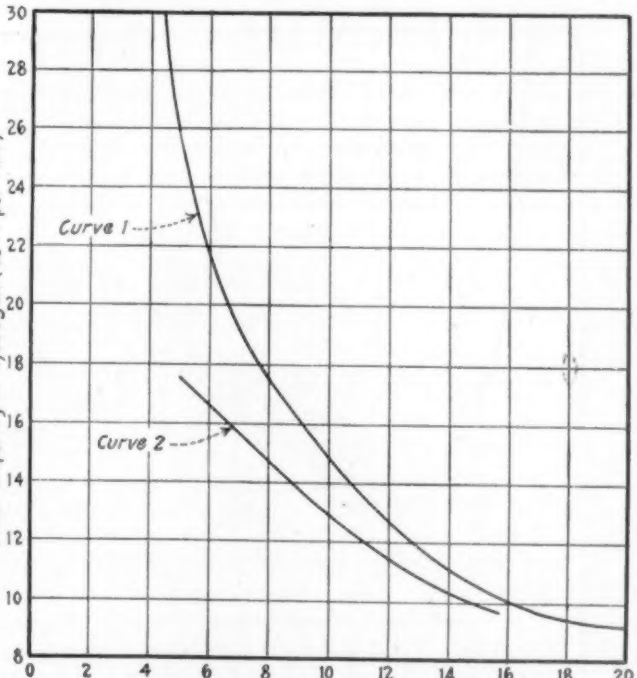


FIG. 10—TOTAL IMPURITY IN HYDROGEN
Curve 1—Graphic average of six runs at 2 gal. per minute.
Curve 2—Graphic average of six runs at 1 gal. per minute.

residual blast gas and that an amount of carbon monoxide equal to one-half the volume of nitrogen should be ascribed to the same source. Half the percentage of nitrogen was therefore subtracted from the percentage of carbon monoxide found by analysis, and the remainder was multiplied by the rate of hydrogen production. This gave the volume in cubic feet per minute of carbon monoxide produced, presumably from some source other than residual blast gas. The figures so obtained throw much more light on the question of the source of the carbon monoxide than do the analyses alone and will be frequently referred to.

Eliminating Oil and Coke

No considerable part of the oxygen could have come from the oil, since the amount of carbon monoxide produced per unit time was almost, if not quite, independent of the rate at which the oil was introduced. (See Fig. 10.) Consequently, a sudden increase in the rate of hydrogen production was always accompanied by a corresponding decrease in the percentage of carbon monoxide in the gas. A change in rate of production was also, of course, accompanied by a change in the percentage of methane present, the effects upon the concentration of methane and carbon monoxide being in opposite directions. Consequently, an increase in rate of production near the beginning of a run, when carbon monoxide was the dominant impurity, always resulted in an increase of purity of the hydrogen; near the end of a run, when methane was in excess, a change of rate had the opposite effect upon the purity of the hydrogen; and at an intermediate stage of production the effects upon carbon monoxide and methane balance each other and a change of rate has no noticeable effect upon the percentage of impurity present. These effects are clearly shown by all the later runs, notably Nos. 35 and 38, Figs. 8 and 11.

That the oxygen did not come from the oil is also indicated by the fact that the amount of carbon monoxide produced was the same whether kerosene or fuel oil was used. The amount of carbon monoxide observed

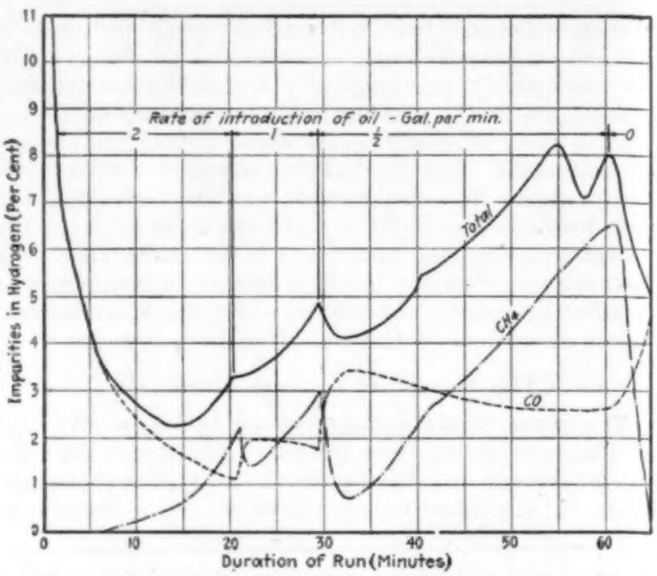


Fig. 12—Effect of rate of production on purity at different stages (run 44).

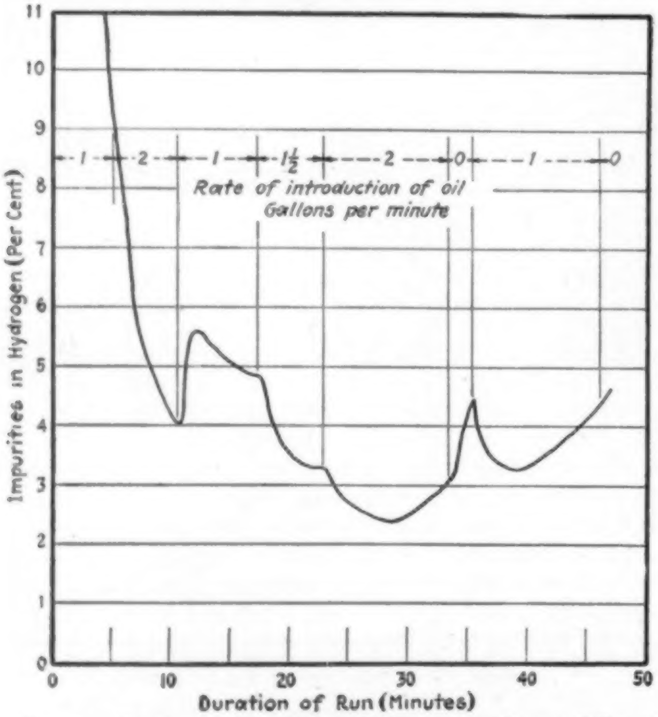


Fig. 11—Effect of rate of production on purity at different stages (run 38).

in some of the runs would have required as much as 12 to 15 per cent of any oxygen-containing organic compound; the occurrence of such a compound in such amounts in each of two refined petroleum oils is in itself so improbable as to eliminate the oil from further consideration as a source of oxygen. Water itself in any such quantity must have occurred as a visible emulsion.

The coke probably did contain enough water at all times to drive out included air and fill the interstices of the solid with steam, but water or any organic compound of oxygen would have reacted with the carbon to form carbon monoxide at temperatures far below those actually employed, and all but a small part of the gas would have escaped during blasting. During one period for which computations were made, the carbon monoxide produced during the runs, if confined in the total volume occupied by the loosely piled coke, would have exerted, at the operating temperature, a pressure of at least 300 atmospheres.

The possibility of water leaking into the generator was one of the first considered, but there was no evidence of such a leak at the only point at which it could have occurred.

The Remaining Sources of Hydrogen

Water from the linings, and iron oxide or other materials which can be alternately reduced and oxidized, alone remain as sources of oxygen. There is abundant evidence that each of these played some part in the actual formation of carbon monoxide.

The reactions involved are very simple. Water vapor will react with carbon to produce carbon monoxide and hydrogen, while iron oxide will react with hydrogen to produce water, which will immediately give carbon monoxide. The reduced iron remains in the generator until the next blast, when it is again oxidized by air or even by carbon dioxide and so carries oxygen over into the next run.

A considerable part of the impurity can unquestionably be ascribed to water in the linings of the generator and checker-brick tower, which consisted of firebrick backed by Silocel powder. The latter material was packed into position in the form of a paste, and the water in the paste could escape only by evaporation. It may even have been partly renewed in some cases

where wet coke was put into the machine, and the steam produced may have entered the colder parts of the lining and there condensed.

The source of the reactive iron is not so easily ascertained. Some parts of the shell and connections were exposed to relatively high temperatures, especially valve stems and the metal not covered by the lining around the secondary air inlets, the charging and stack valves, and the sight holes. Some iron, no doubt, came from scale from various metal parts during erection and use, some from pyrometer tubes, some from lintels and old grate bars,[2] some from ash of the fuel, and some from iron oxide in the refractories. Some iron rust may even have been carried in suspension by the oil from the storage tank and connections.

The iron oxide in the refractories was probably the greatest single source of oxygen. The dust produced by rubbing together two of the checker brick took up 0.1 per cent of its weight of oxygen when heated to redness in an oxidizing atmosphere and lost the same amount in an atmosphere of hydrogen. This test was repeated two or three times consistently. The brick were porous enough to account for an enormous effective surface exposed to the action of the gases.

The Case Against the Lining

The following facts point to water from the lining as a source of a considerable part, at least, of the carbon monoxide:

(1) There is a tendency for the amount of carbon monoxide produced per minute to increase during the period of experimentation. This, no doubt, corresponds to a drying out of the Silocel.

(2) No direct connection can be traced between the rate of carbon monoxide formation in the different runs and the temperature at the beginning of the run, but there was a decided tendency for the carbon monoxide production to increase during the first two or three runs following a shut-down. This was to be expected, since the rate of escape of water vapor from the wet outer layer of the lining was no doubt proportional to the amount of heat conducted through firebrick and dry inner Silocel.

(3) That some water still remained to be evaporated was proved when the lining of the generator was torn down after the experiments. A sample of the Silocel from near the top of the generator was found still to contain over 5 per cent of water, enough to condense in the top of a test tube when a few grams of the powder was heated in the bottom.

(4) At various times, but especially when running oil directly onto the coke, the generator became clogged with carbon to such an extent that the pressure of hydrogen would force open the stack valve. Every time this occurred a sharp increase of carbon monoxide was shown just before the valve opened. It even became possible to predict with some accuracy when the valve would open by watching the purity recorder. The sudden increase of impurity was, no doubt, caused by the hydrogen being forced through the porous lining, carrying with it an unusual amount of steam. This explanation was verified by broad streaks of lampblack found in the Silocel when the lining of the generator was torn out.

[2]The lintels which support the lining above the ash pit and fire doors were found to be fused about three-fourths of the way through the lining after the experiments.

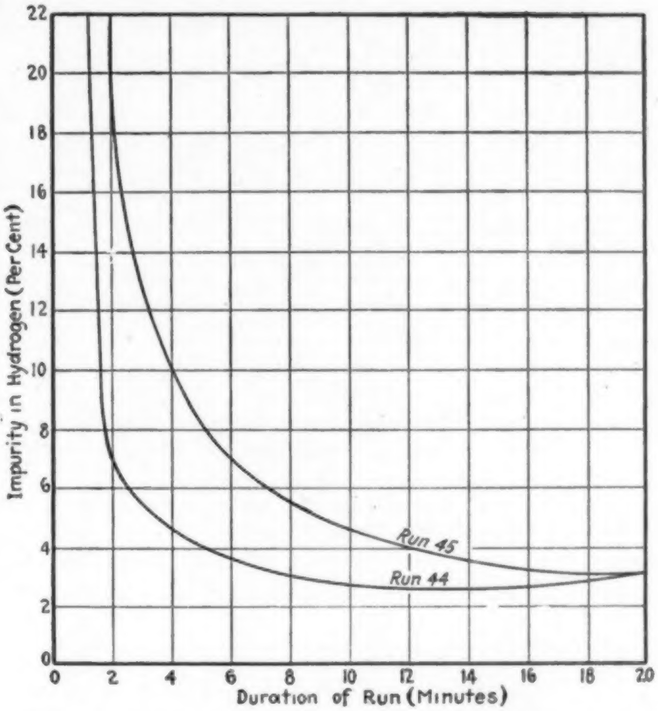


Fig. 14—First 20 min. of runs 44 and 45, showing effect of preliminary reduction on purity of hydrogen. 2 gal. of oil introduced into machine 10 min. before beginning run 44.

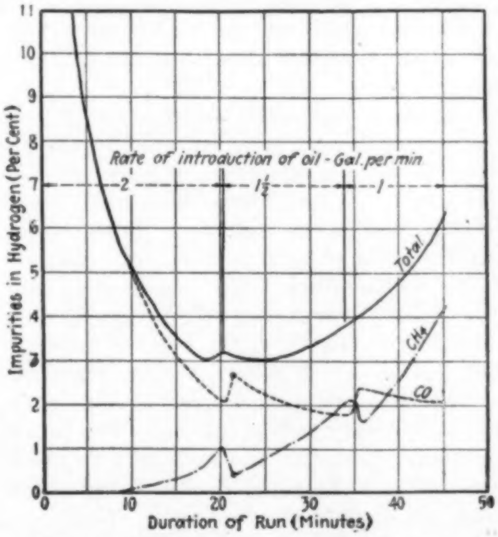


Fig. 13—Effect of rate of production on purity at different stages (run 45).

The Case Against the Iron Oxide

That iron oxide caused the formation of a large quantity of carbon monoxide is indicated by the following facts:

(1) It is impossible to account for the variation in the rate of formation of carbon monoxide during a single run by assuming that it all comes from water in the lining. The lag involved in the conduction of heat through firebrick and dry Silocel is such that no rapid variation in the rate of vaporization of the water in the wet Silocel can be credited. Even if there were no lag, but the amount of heat transmitted through the lining was always exactly proportional to the difference in temperature, no variation greater than about 20 per cent could be accounted for in the rate of formation of carbon monoxide between the beginning and the end of the run; while the observed variation usually amounted to several hundred per cent.

(2) The amount of carbon monoxide formed was

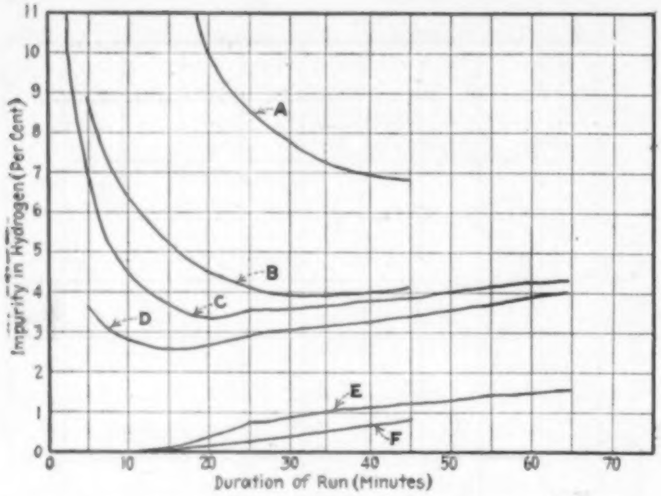


FIG. 15—COMPOSITION OF HYDROGEN IN HOLDER FROM RUNS 44 AND 45

Curve *A*—Run 45. Total impurity, all gas saved.
Curve *B*—Run 45. Total impurity, gas wasted during first 5 min.
Curve *C*—Run 44. Total impurity, all gas saved.
Curve *D*—Run 44. Total impurity, gas wasted during first 5 min.
Curve *E*—Run 44. Methane.
Curve *F*—Run 45. Methane.

greatly diminished by introducing a little oil several minutes before beginning to run and permitting it largely to reduce the iron oxide present. This is clearly shown by a comparison between runs 44 and 45, of which the complete purity curves are given in Figs. 12 and 13. These runs were made under conditions very similar in all respects except that in the case of run 44 about 2 gal. of oil was introduced into the generator 10 minutes before beginning continuous operation. Fig. 14 shows the first portion of the same purity curves on an enlarged time scale and a reduced purity scale. These curves are continued to represent the course of the runs only so long as oil was introduced at the initial rate. The practical effect of the preliminary reduction is strikingly illustrated in Fig. 15, which shows the percentage of impurity in all the gas delivered to the holder in the case of the two runs. In these and all other runs an amount of hydrogen equal to at least the volume of the shells was wasted through

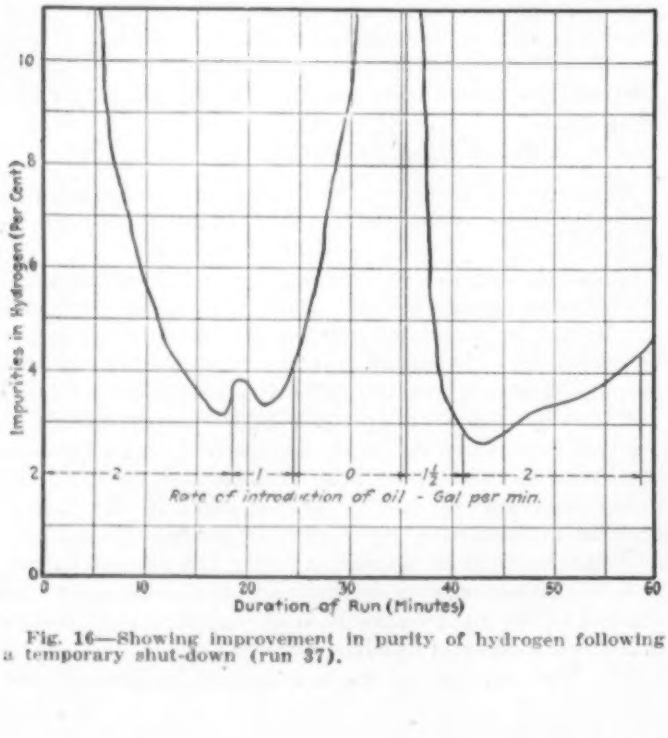


Fig. 16—Showing improvement in purity of hydrogen following a temporary shut-down (run 37).

a purge valve before the gas was turned through the meter and the figures represent only the gas actually metered. It is apparent that the use of 10 gal. of oil during a period of 5 minutes is less effective in eliminating impurities than is the use of 2 gal. 10 minutes before the run.

Fig. 16 also illustrates in a striking manner the result of a long period of reduction upon the impurities in the gas. In this case the introduction of oil was interrupted for 11 minutes after a 25-minute run. When production was again started, gas of higher purity was produced in greater quantity than during the first portion of the run in spite of the heat lost during 25 minutes of operation and 10 minutes of idleness.

(3) The smallest rate of production of impurities occurring in any of the experiments was in run 26 (Fig. 6). In this run the oil was vaporized in the upper part of the coke bed, and during the first 7 minutes was passed through the checker-brick tower only. When the gas was then directed through the coke, the remarkably low rate of 1.2 cu.ft. of impurity per minute was observed both from the record of the automatic recorder

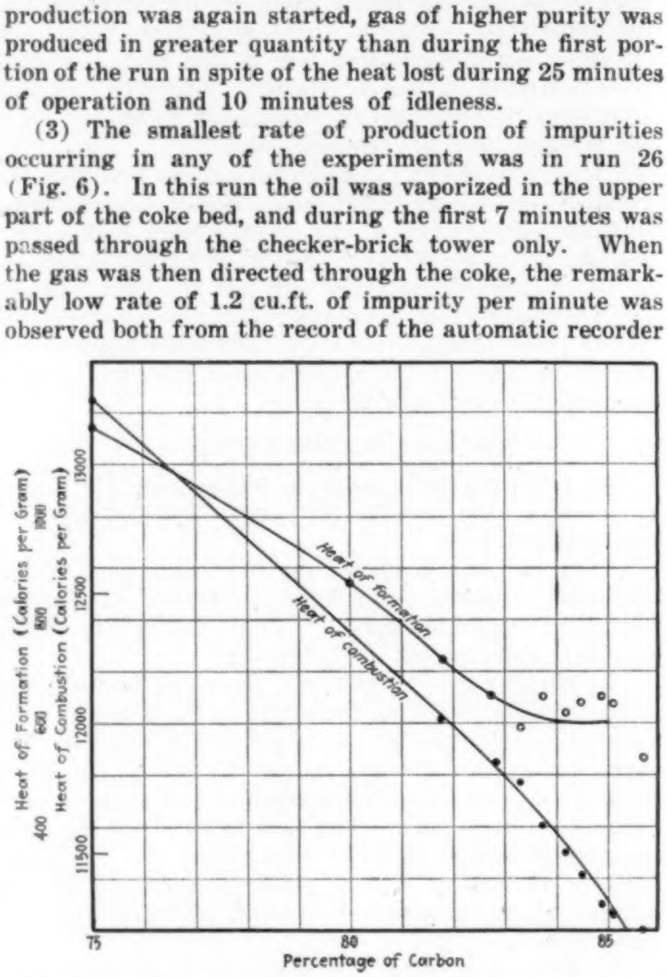


Fig. 17—Heats of formation and combustion of paraffine hydrocarbons.

and from volumetric analysis. The result was obtained by the use of a practically fresh coke bed which eliminated methane, while at the same time the carbon monoxide production was small because of the previous reduction of oxides.

(4) It has been suggested that the reduction of silica in the refractories may have resulted in the formation of much of the carbon monoxide, silicon or carborundum being produced. If this were the case, however, the rate of formation of the gas in the presence of a large excess of the solid should be a rapidly changing function of the temperature. No increase in the rate of formation with increase of temperature was noted, however. On the contrary, the results indicate the reverse, but this apparent reversal is no doubt due to the fact that the highest temperatures were employed after the lining was pretty well dried out. The independence of temperature shown by the rate of formation of carbon monoxide and the rapid decline of the rate during a run can be explained only by a chemical reaction which would take place at a much lower temperature

but which is limited by the small amount of the reacting substance present. The evidence again points to iron oxide, although it is possible that some other oxide present in small quantity may have had some part.

Thermal Balance of the Process

The heats of combustion of various saturated hydrocarbons of the paraffine series, taken from the Landolt-Börnstein Tables, are shown in Fig. 17, together with their heats of formation obtained by subtracting the observed heat of combustion from the heat of combustion of the component carbon and hydrogen. Since the observations on heat of combustion were mostly made with bomb calorimeters, it is evident that the "heat of formation" here given includes the heat of vaporization and represents the total amount of heat which must be supplied by the checker brick and coke to vaporize and decompose the oil.

All of the paraffine hydrocarbons that are liquid at ordinary temperatures contain between 83.33 and 85.75 per cent of carbon. It is apparent, therefore, that it makes little difference what oil is used, either as to yield of hydrogen, fuel value of the deposited carbon, or heat required to decompose the oil. Provided the checker brick is sufficiently hot to vaporize the heavier oil, practically the same results should be secured from the use of the same weight of a heavy lubricating oil, or even solid paraffine, as from gasoline or kerosene.

It is assumed, for the purpose of drawing an approximate thermal balance, that an oil of specific gravity, 0.80, containing 85 per cent carbon, is used under the operating conditions of run 45, which are believed to represent about the most favorable operating conditions for this plant. (The question of preliminary reduction of the iron oxide in order to avoid the formation of carbon monoxide has practically nothing to do with the thermal balance.) It is also assumed that 75 per cent of the carbon of the oil was deposited on the checker brick and that this was burned to CO only, the carbon in the generator being all burned to CO_2.

Table II then represents roughly the thermal balance indicated by the observations made on run 45, in which 13,680 cu.ft. of hydrogen was produced.

TABLE II—APPROXIMATE THERMAL BALANCE OF EXPERIMENTAL PLANT

	Total Kg. Cal.	B.t.u. Per Cu.Ft. of Hydrogen
Potential heat of fuels used:		
247 kg. oil	2,790,000	718
159 kg. coke	1,280,000	329
Total fuel used	4,070,000	1,046
Heat accounted for:		
Potential heat of 37 kg. hydrogen	1,260,000	324
Heat required to vaporize and decompose 247 kg. oil	160,000	41
Sensible heat in 37 kg. hydrogen at 1,200 deg. C	160,000	41
Sensible heat in products of combustion of carbon at 1,000 deg. C	885,000	228
Potential heat of 370 kg. CO	900,000	231
Miscellaneous losses, including radiation, carbon suspended in hydrogen, purges and leakage	705,000	181
Total	4,070,000	1,046

The figures in Table II are very rough approximations only. In particular the temperatures at which hydrogen and blast gas leave the plant are mere estimates. The balance is sufficiently near the truth, however, to show the very poor thermal efficiency of the process and to indicate the direction in which to work for improvement.

The concluding article in this series, which will discuss the arrangement and operation of the plant for thermal efficiency, will be published in a subsequent issue.

Plan for Critical Tables of Constants

The International Critical Tables of Physical and Chemical Constants have been outlined to some extent by the editorial board. The very general interest aroused by this work is due to the wide application of constants involved, bearing as they do upon a very broad range of industries. The scope of the tables is indicated by the following topics: Chemical kinetics, kinetics of physical processes, diffusion, molecular kinetics, chemical equilibrium, pressure-volume-temperature relations in homogeneous systems (does not include H_2O, CO_2, SO_2, Na_2, Hg, air, N, H, Si), phase relations in heterogeneous systems, volume change accompanying change in phase where directly determined, properties of surfaces, electrochemistry, thermochemistry, photochemistry, mechanics, sound, heat, radiometry (including spectrophotometry, electricity, magnetism, electronics, ionization of gases, X-rays, miscellaneous tables of useful information, certain biological data, assembled properties of selected materials, conversion tables, tables of units and standards, standardization tables, and computational tables.

Among the industrial materials on which data are to be included are the following: Minerals; alloys, amalgams and commercial metals; abrasives, ceramic cements and cementing materials, exclusive of refractory cements; clays; heavy clay products; natural building materials of mineral origin; refractory materials, including refractory cements; white wares, including laboratory porcelain, electrical porcelain, etc.; commercial glasses; vitreous enamels; thermal insulating materials for high temperature; low-temperature insulating materials; woods; rubber and artificial plastics; carbon for electrical purposes; mica; transformer oils and other liquid electrical insulating materials; asphalts, bitumens, tars, pitches, mineral waxes and creosotes; lubricants; liquid fuels; solid fuels; animal and vegetable oils, fats and waxes, including hydrogenated oils but excluding essential oils and processed oils; essential oils; natural and artificial resins, gums and balsams; odoriferous materials; solid secretions of animal origin, such as bone, ivory, shell, horn, coral, etc., and some artificial substitutes; skins, leather and leather substitutes; cat gut and allied substances; textile fibers, including animal, vegetable, mineral and artificial; sponges, mosses, sea grasses, etc.; explosives; tannins; dyes, pigments and coloring materials; sweetening agents; foodstuffs; adhesives; paper; paints, varnishes, airplane dopes and raw materials; refrigerating brines; nitrating acids; molding sands.

Jersey Sand as a Water Softener

Green sand marl is suitable for direct use as a water-softening agent, says the geology division of the Department of Conservation of Development of the State of New Jersey. Large quantities of this green sand occur in southern Jersey. The state bulletin says:

"After certain preliminary treatment, which charges it with exchangeable sodium, the marl is placed in the water softener and the water allowed to flow through it in a manner somewhat resembling the ordinary filter. The exchangeable sodium of the treated marl combines with the calcium and magnesium, the presence of which causes the hard water. The marl in turn gives up a proportionate quantity of sodium to the water. To restore it to complete efficiency it is necessary only to pass a solution of brine through the apparatus"

Principles of Chemical Engineering*

A Symposium Review of an Outstanding Work on Chemical Engineering of Value Alike to the Student in College and to the Seasoned Engineer

The Book: Its Significance

The Older Engineer Will Welcome This Volume as Enthusiastically as the Student

BY HENRY HOWARD
President, American Institute of Chemical Engineers

THIS BOOK will be found useful to every chemical engineer as a part of his working library. When Davis in 1901 brought out his "Hand Book of Chemical Engineering" in England, he was striking into what was then an almost untouched field. I do not know of anything that will impress one more as to the progress made in the "science" of chemical engineering than a comparison of these two books.

Another point that cannot fail to impress anyone who is not familiar with chemical engineering is the wide range of technical knowledge that is required by the well-trained chemical engineer of today. The authors should be particularly commended for the way in which they present the fundamental theoretical conceptions, both physical and chemical, which underlie or at least give useful explanations of the various subjects covered. The chapter on combustion deserves special mention, because of the suggestive way in which the subject is discussed.

The book is particularly valuable to older engineers who have not had the benefit of modern systems of instruction, in that the mathematical and chemical calculations are so carefully and logically developed that the older engineer will find their study most stimulating.

It is to be hoped that the present volume is merely the forerunner of amplified editions that the same authors will bring out from time to time, as was the habit of Dr. George Lunge in his various editions of "Sulphuric Acid and Alkali," which have performed such a wonderful service for the chemical industry of the world.

This criticism would not be complete without pointing out what seem to me to be shortcomings in the book. The space given to heating by powdered fuel and oil firing seems inadequate. Both of these methods are being widely adopted in chemical processes, especially where uniform conditions of temperature and oxidizing or reducing atmospheres are required. Inexpensive and satisfactory powdered coal equipment that requires no preliminary coal drier and which presents no explosion hazard is now available—for instance, the Aero pulverizer. The chapter on crushing and grinding gives some excellent information and data, but principally describes apparatus useful for very large-scale operations that are more commonly met with in mining.

Many more criticisms could be made, but the fact remains that the book presents much new material and is a very real contribution to the literature on this subject. It should be in every chemical engineer's library.

*"Principles of Chemical Engineering." by William H. Walker, Warren K. Lewis and William H. McAdams. New York: McGraw-Hill Book Co., 1923. 637 pages, $5 net.

Industrial Stoichiometry

A Difficult But Necessary Subject for the Chemical Engineer Presented in a Common-Sense, Usable Way

BY JOHN MORRIS WEISS
Consulting Chemical Engineer, New York City

THE chapter on the elements of industrial stoichiometry might well have been entitled the elements of mathematical common-sense. The author has taken the attitude that figures should be our servant and not a bogy. The simplification of the methods of calculation from one system of units to another by placing all figures on a molecular or atomic basis, though not new, is presented in a very clear and thorough fashion.

This chapter also brings to the attention of the reader a few of the more useful approximations of physical chemistry such as Trouton's formula for latent heats of vaporization. These are indeed extremely useful and will often serve for the sufficiently approximate solution of a problem in cases where exact data are unavailable in the literature and where the determination of the exact data would entail a burden out of proportion to the resulting extra exactitude of results.

The section entitled "Efficiency" would, in the writer's opinion, be advantageously susceptible of enlargement. There are many types of industrial processes in which the way the yield figures are stated is often puzzling and not co-ordinated. In the single example given, the author should have been more explicit in his definition of "recoverable salt." If he meant recoverable in the same state of purity as the original crude salt, his mathematical interpretation is the correct one. Some factor, however, should be introduced to distinguish two processes which by the author's method might show the same mathematical efficiency and yet the output *in one cycle* per unit of crude might make one process immeasurably more efficient commercially than the other.

The sections on "Choice of Data" and "Sampling" are to be highly commended. There is no doubt that in many instances chemists and engineers collect many useless data at great expense while neglecting obvious data readily obtained with little or no effort. In the discussion of the boiler tests and in the sample calculations given it would seem rather dangerous to base extensive calculations on the results ordinarily obtained with an Orsat gas apparatus, and it would seem desirable, where such calculations are to be made, to suggest the use of a more accurate analytical method than the one used. The section on "Sampling" is very pertinent and too much emphasis cannot be placed on its importance. The writer feels that similar emphasis might well have

been placed on the selection of accurate analytical methods and care in the application of these methods to the materials of the process.

On the whole, the chapter is stimulating and suggestive and represents a real contribution to chemical engineering thought. The principles are sound and, I believe, most useful to the practical experienced man. In fact, I feel that in the hands of the inexperienced the chapter may prove a dangerous tool. In Illustration I, if there is soot from either incomplete combustion or a leakage of air in the setting of the boiler, the calculations of the various results might be seriously in error. No doubt such matters are considered in later chapters, which at the time of this review I have not seen.

To the seasoned engineer, however, such matters are obvious, and to him the work is extremely useful, replete as it is with helpful suggestion and simplification of the mathematical problems with which we all have to deal in our daily work.

The Physical Basis for Chemical Engineering

The Chapters on Fluid Films, Flow of Fluids and Flow of Heat Form an Engineering Background to the More Restricted Consideration of Special Equipment

By George L. Mitchill, M.E.
New York City

Valuable technical books are being published continually; but it is only at rare intervals that a book is issued of such outstanding interest that it marks an epoch for its field. Such a book, to our mind, is "Principles of Chemical Engineering," by Professors Walker, Lewis and McAdams of M.I.T. It is the first successful attempt to place the study of chemical engineering on a basis of rational fundamentals. As a contribution to the text-book literature of this subject it marks the beginning of a new attitude toward chemical engineering.

That part of this work dealing with "Fluid Films" is descriptive, merely defining and declaring the existence of such films, and explaining their general effect on the flow of liquids and the transfer of heat. Incidentally the existence of such films is shown to explain the difficulty with which liquids commonly dissolve or absorb minute particles suspended in the air or other gas with which they are in contact. A clear conception of the nature of such films and their bearing on engineering problems can be drawn from this part of the work.

The treatment of the "Flow of Fluids" thoroughly covers the broad field indicated by the title. Introducing the conception of potential pressure and velocity head early, the authors show the manner in which these are connected with the action of various types of devices used for measuring pressure and flow. After a discussion of the mechanism of flow through conduits, these devices are considered with reference to the effect of changes in volume, temperature, viscosity, etc., on the indications read on various types and the energy loss incidental to their use.

In that part of the work devoted to the flow of heat, the authors define and thoroughly consider the mechanisms of conduction, convection and radiation of heat. Proper consideration is given to the effect of various complicating factors which so often intrude themselves in practice.

In scope, these chapters are not as broad as the titles, though they are in exact conformity with the title of the book. True engineering is the application of these "principles."

The scope and treatment are as applicable to mechanical or any other form of engineering as they are to chemical engineering, which is as it should be. The chemical engineer is expected to apply the principles of the science of chemistry; but to produce commercially successful results he must have recourse to the application of the science of mechanisms. He would hardly be expected to design heavy machines; but he would surely be expected to outline the piping system he required to handle his liquids or gases—that seems such a simple matter. However, the general design of an economical piping layout involves many factors and considerations quite foreign to chemistry, but these will also be controlled to a considerable extent by the chemical engineering. For example, piping a liquid at a certain temperature may so decrease its viscosity as to result in a distinct saving in power, offset perhaps by the cost of insulating the piping. There may be a technical as well as an economical limit to this temperature. The chemical engineer must possess the knowledge to control both factors to be truly successful.

Perhaps the above is a poor example, but it illustrates the point. A text book of chemical engineering should include the basic principles of mechanical engineering, with particular stress on such matters as flow of liquids and heat. This one does.

As to general scope and viewpoint, then, this book is what it sets out to be. Now, is it a good engineering textbook as to the line drawn where principles end and specific commercial methods begin? It is. It is no condensed catalog of flow meters, oil heaters, or pyrometers, notwithstanding that the principles of these and many other devices are considered.

Does it lean too far the other way? Does it dwell on the discovery of this or that natural law or detail of experimental methods by which physical constants were discovered? It does not. The laws are stated and formulated, the constants tabulated, and then the application is shown—which in the writer's opinion constitutes engineering.

Good engineering must be not only sound in its application of natural laws and physical constants, but must be reasonable. The formulas mathematically derived therefrom should be simplified by appropriate assumptions and approximations consistent with the degree of reliability necessary to commercial results. This book does so. The simplifications generally permissible or permissible in special cases are quite usually indicated.

Much more might be said along these lines, in general quite favorable to the book, as judged from the part here reviewed. But there is a different point to be considered. A text for students should be readable and interesting, consistent with brevity and complete mathematical

demonstration, if it is to be of much use in connection with American methods of teaching. For my part, I found this text interesting reading. References are well placed and easily found and the general arrangement is such as to avoid defeating the end of the work by breaking the student's train of thought.

All the above might be said without justifying the existence of the book as a text, especially if it is new. There are many such already. One might collect matter from this one and that one, arrange it differently perhaps, and evolve a new book satisfying most of the requirements of an engineering text. But such a book might not be at all justified. A new book should contain something new—not only as to arrangement but if possible as to material and information. I am impressed with the references to up-to-date literature and experiments and also such matters as the close consideration of fluid films in most problems in both flow of fluids and of heat. Also the discarding of empirical friction coefficients and the general solution of flow of liquid problems by a formula and curves which take into consideration all the many factors involved.

The authors should polish up some of their text, slightly change the form of a few formulas, stress some points differently and make a few typographical corrections. But I feel that the general arrangement and mode of presentation will stand the test.

The Art of Drying

A Subject Which Has Labored Under a Burden of Empiricism Is Brought by the Authors to the Dignity of a Science

By A. W. Lissauer
W. L. Fleischer & Co., Engineers, New York City

The art of drying deserves recognition as a science, and a helping hand to aid its ascent from among the rule-of-thumb trades to its rightful place with others deemed worthy of academic study. It is not difficult to see why this has been a subject relegated to the tender mercies of the plant mechanic for solution; the removal of water by evaporation seems so simple—only a few trays, a box, some pipe coils and perhaps a fan, and presto! another drier is created. And at the same time is created one of two mental attitudes: if the mechanic by chance happens to guess right, "drying problems are too simple to bother with scientifically"; but if he happens to guess wrong, some one else, perhaps the office boy, is given an opportunity to outguess Nature! In either event, no attempt is made to discover the whys and wherefores, no data are collected, no progress is made. It is true that manufacturers of drying equipment have made valiant attempts to find out why their apparatus functions—or otherwise; but such data, all too often unfortunately, are crystallized into a "one grain per cubic foot absorption" philosopher's stone, or a collection of "designs of driers that have worked."

It is a great step forward in the right direction, then, to have the authors of this work on chemical engineering devote so large a part of it to this subject. One cannot help being impressed with the fact that they, among the leaders in their field, are convinced that sure, efficient and economical drying is one of the essential processes in modern industrial engineering. So also the reader is convinced of the inclusive background of properly and scientifically carried out experimental work, without which the most erudite analysis is merely scientific guesswork.

Everyone will acknowledge that the drying field is large; perhaps two-thirds of our industries require or use some type of such apparatus. It is, therefore, unfortunate that only a chapter has been allotted to contain within its bounds all that has been deemed worthy. Such concentration inevitably means generalization, with consequent danger of misleading the inexperienced who are unable to guide themselves concretely with only the general direction pointed out. The interest which this book will create will, it is hoped, encourage the authors to enlarge on the subject and to include a résumé of their experimental work, the results of which, as is so clearly pointed out, are so necessary for the solution of specific problems.

This chapter on drying is welcomed as an earnest effort to place the subject in its deserved place among the other chemical engineering processes; that those who refer to the book will be convinced that this has been accomplished is a foregone conclusion.

Evaporation and Evaporators

The Mechanism of Vaporization and Its Application in Various Processes of Evaporation and Types of Equipment

By E. J. Winter
Consulting Chemical Engineer, New York City

Pages 375 to 435 deal with evaporation and evaporators. The mechanism of vaporization is explained, the factors controlling it are enumerated; and all evaporation processes are subdivided into four classes, according to heat supply and vapor removal. Steam-heated evaporators have been given the prominence they deserve. The true importance of vacuum and multiple effect evaporators is explained, and the various considerations which govern proper design are carefully evolved.

The evaporators themselves are subdivided into eight groups, according to design and method of operation. Some of these groups are never met with in practice, although they are of real theoretical interest.

The authors discourage the use of exhaust steam, basing their conclusions on prime movers of the highest class. Nothing is said about the auxiliaries. This question must be decided, in each case, by a heat balance of the entire plant, and not by a general rule. Where exhaust steam is used for evaporation and the feed water enters the boilers cold, the use of exhaust steam is very costly.

The usual difficulties encountered during operation are taken up one by one and suggestions are made, in each case, for the diagnosis of the trouble and the remedy. The method of calculation for evaporator design is very carefully set forth, and two examples have been solved. The equations for multiple effect evaporation have been included, but in the examples shown the "trial and error" method is used, as is always done in practice.

Basic Principles of Distillation

The Separation of Liquids From Liquids Placed on a Rational Basis and Illustrated by Examples From Practice

BY E. J. WINTER
Consulting Chemical Engineer, New York City

THE concluding pages of the book are devoted to a careful and authoritative exposition of the various distillation processes. The underlying principles in the separation of immiscible, partly miscible, and mutually soluble liquids are explained; the limitations of Raoult's and Henry's laws are shown; and the correct method of procedure is deduced and applied in several examples. The minimum reflux and the effect of various reflux ratios have been determined by calculation, and are shown graphically; and the number of plates required deduced therefrom.

On page 602 a novel and very ingenious method is offered for calculating the point at which the feed should enter the column. It is based on equal "enrichment rates" of the plates, keeping the rate of rectification constant throughout the column.

The authors remark: "It would seem that in commercial practice the feed is often introduced too high up the column." In a number of cases this is merely apparent and well justified. Sorel and Mariller tested a mixture of pure ethyl alcohol and pure water, and the authors based their calculations on these results. The distiller's high-wines, however, contain a number of troublesome compounds, among others the fusel oils. These are high boiling, very sparingly miscible in water, but completely soluble in ethyl alcohol. The "exhausting" plates of the rectifying column—i.e., those under the feed plate—are poor in alcohol; fusel oil forms constant boiling mixtures with water, evaporating at a lower temperature than ethyl alcohol. In other words, the water in the immiscible mixture evaporates before the alcohol, and it becomes impossible to exhaust the waste on the number of exhaust plates calculated by the authors.

The two expressions for the free energy of separation of liquid mixtures are no better than the assumptions they were based upon, but the conclusions drawn therefrom are undoubtedly true. Compared with the minimum work of separation, distillation-rectification is a very inefficient process.

Usually the chemical engineer has no other means at his disposal for the separation of liquid mixture. Occasionally, however, other (chemical) means are available as well; and the surprising inefficiency of the method becomes evident by comparison. This in nowise detracts from the basic importance of distillation.

Gas Producers—Their Design and Operation

The Industrial Use of Producer Gas Is Increasing and Its Generation Is of Much Importance to the Engineer

BY G. L. MONTGOMERY
Assistant Editor, *Chem. & Met.*

THE use of various types of fuel gas is of ever-increasing importance, as the authors have pointed out in earlier chapters. As this use increases, the equipment for manufacturing the gas must also increase in importance. Thus it seems to me extremely fitting that the subject of gas producers should be given a fairly thorough treatment in any work written primarily as a text for chemical engineering students.

The subject is treated from the standpoint of description of an ideal producer, having reference to the governing factors in the design and operation of the various elements; the application of these principles in various commercially successful producers; and the methods by which the production and efficiency of a producer may be figured for varying conditions of operation.

In the compass of an extremely small space, sufficient information is clearly and correctly brought forward to satisfy the needs of all except the engineer who specializes in producer design or control. In accordance with the general scheme of the book, the chemical engineer is here presented with the basic facts which he needs to know about gas producers.

Of particular interest is the development of the production computation. The authors have here applied their special type of equation, which is of value in that it shows at all points what the unit is and provides an extremely easy expression to check in case of error. So many cases of confusion in figuring the production of gas-making equipment have come to the writer's attention that a grounding of the student in such a clear method seems the noteworthy point in this part of the book.

Fuels—Their Combustion and Apparatus

Since Fuel Is Basic to the Production of Heat, Its Use Is of Primary Importance to the Chemical Engineer

BY JOSEPH A. DOYLE
Vice-President W. S. Rockwell Co., New York City

THE chapters on fuels and power, combustion and furnaces and kilns present a constructive, definite and conservative analysis of the subjects in question. It is pleasing to note that the authors have definitely expressed their views without the usual qualifications that leave the reader in doubt.

The orthodox method of treatment in the usual considerations of fuels, power, furnaces, methods of heating, etc., is not as broad as it should be; perhaps we should be more concerned with the use made of heat than with the process of making it. After all, the chemical industry is, like the metallurgical industry, more concerned with the quality and the cost of the product than with an abstract consideration of fuels, combustion and equipment.

For these reasons, the chapters of this work such as that on furnaces and kilns, which deal with the equipment for utilizing heat, were of most

interest to me and afford an opportunity for future expansion promising much good for the art. While in many details my experience does not run exactly parallel to that of the authors, the book gives a good picture of the fundamentals and as a text for the beginner in the art of chemical engineering should prove a work of real value.

Humidity, Thermometry and Related Equipment

The Design and Use of Much Equipment of Great Importance to the Chemical Engineer Is Properly Founded on a Consideration of the Amount of Water Vapor Present in Some Gas

BY C. H. KIMBERLY
Binks Spray Equipment Co., New York City

THE general plan of this part of the book is excellently worked out and indicates that it can be well adapted to use for a text where the details are explained by a person thoroughly familiar with the physics and mathematics of the subject. However, for use by a student or practical engineer handling the entire field of chemical engineering, the very thoroughness and length to which the authors have gone in dealing with this phase of the work have a great tendency to cloud the understanding of one searching for information.

The definitions are well worded and as complete as is required and give a clear knowledge of their subjects. The use of problems to explain the principles and operation of the practical side is admirable. The charts are, however, not sufficiently explained, or their lines defined, to allow of their being put to practical use without a detailed study of the authors' intention.

The illustrations are excellent and cover the distinctive types correctly; but a few others showing the application of spray cooling ponds, evaporators, etc., would be of great help if the volume is used outside the class room. The authors apparently have a thorough knowledge of the subject and have given it a deep and excellent treatment, and the book, if used under direction of a competent instructor and as a text book, should meet a decided need and be of much value.

Crushing, Grinding and Separation

A Subject of Growing Importance to the Chemical Engineer Is Well Covered in This Book

BY EDWARD H. ROBIE
Assistant Editor, *Engineering and Mining Journal-Press*

CRUSHING and grinding and the mechanical separation of materials form an important part of many chemical processes. The authors are well advised in devoting sixty-seven pages of the book to these subjects. After discussing briefly the theoretical side of crushing and grinding, the factors on which the selection of machines is based are outlined. Apparatus is logically classified in four divisions: preliminary breakers, intermediate crushers, fine crushers, and fine pulverizers. For breaking the largest pieces, jaw or gyratory crushers are ordinarily used, three forms of the former and one of the latter being described briefly. The Symons disk machine (incorrectly spelled "Symonds) is the only form of apparatus mentioned under the head of intermediate crushers, though the use of gyratories and rolls is somewhat more common for the size of feed included in this designation—i.e., 1½ to 2 in. Rolls, however, are described under the heading of fine crushers, along with rotary crushers, stamps and the Chilean mill.

The section on fine pulverizers includes descriptions of cylindrical and conical ball mills, tube mills, centrifugal roll mills, burr mills and disintegrators. Ball mills are extremely popular, particularly in the mining field, the Marcy and Hardinge types being described briefly. The ways in which the fineness of the product of a ball mill may be regulated are well stated, though exception might be taken to the statement, "There is a certain amount of grinding or shearing action taking place in the mill, due to rolling of the balls, but its importance is small compared with the action of the falling balls." I am inclined to think that attrition is the chief way that grinding is accomplished in a ball mill, particularly when the smaller sizes of balls are used.

Speaking generally of the chapters under review, the treatment may be said to be good though brief. For more complete data, such a book as Allen's "Handbook of Ore Dressing" or Truscott's "A Text-book of Ore Dressing" should be consulted.

Filtration—Theoretical and Practical

The Subject Is Covered From the Standpoint of Design, Operation and Utility

BY ARTHUR WRIGHT, M. E.
Filtration Engineers, Inc., New York City

UPON opening this chapter and thumbing over its pages the reader is confronted by a formidable array of mathematical formulas; differential and integral calculus that may well make him fumble back for facility to the math of his sophomore year. The chief interest of the chapter lies in its treatment of "filter calculations" and derivations of formulas.

In contrast to the skimpiness of some parts of this chapter, the paragraphs on "Filter Calculations" are not stinted. We must respect the mass of experimental work undertaken and the thoroughness with which it has been done. This is indeed most important in its endeavor to point the way from loose rule-of-thumb methods by reducing filtration principles to mathematical equations. The authors have made a considerable advance and their work can well be commended.

To sum up, the value of this book is academic, not practical, but it is hone the less important for that. It is a real contribution to the art of filtration and should give rise to increased efforts to reduce to mathematical terms the varied performance of our present-day filtering apparatus.

Machinery and Appliances for Production and Control

Equipment News

From Maker and User

Materials and Accessories for Chemical Industries

High Temperature Refractory

The Celite Products Co. for a number of years has had an insulating brick on the market known as "Sil-O-Cel," which has been used for the insulation of various types of furnaces, boilers, ovens, kilns, etc.

Quite recently this company has developed a calcined brick known as Sil-O-Cel C-22 brick, which is used for severe conditions where the unburned brick might be subjected to a temperature high enough to cause shrinkage. These C-22 brick are recommended for use where the insulation will be subjected to temperatures in excess of 1,650 deg. F. and can be successfully used without any danger of shrinkage at temperatures in excess of 2,000 deg. F. They are composed entirely of Sil-O-Cel and for this reason have a high insulating value. They also have an unusually high crushing strength for an insulating brick.

These brick are for service at extreme operating temperatures and are especially well adapted for use in the combustion zones of power boilers, in furnaces, kilns, etc., which operate at temperatures in excess of 2,500 deg. F.

Pressure Regulator

This is a new regulator for the purpose of regulating the control and delivery of acetylene, oxygen, hydrogen and other high-pressure gases. It is designed to maintain a constant predetermined pressure regardless of fluctuations in the initial pressure line and variations in consumption. This regulator is simple in design. The front cap contains an adjusting key, a top spring button and a tension spring. The body contains in front a flexible metal diaphragm, soldered on. Over this diaphragm is screwed a bronze diaphragm plate or spring button to hold the tension spring. Inside this body is a fixed nozzle containing a loose operating pin. Over the nozzle is loosely assembled the valve sleeve, which has a roll of gas ports drilled through its circumference and carries the valve seat. The seat closes against the nozzle by initial gas pressure on the valve sleeve and pressure of a compensating spring resting in the recessed tank coupling. The loose operating pin inside of the nozzle is actuated at one end by the deflection of the diaphragm and at the other by pressure of the valve sleeve.

MILBURN GAS REGULATOR

It will be noticed from the above description that the regulator closes with the gas pressure and not against it. This enables the sealing to be effected by pressure of several pounds instead of hundreds of pounds, as would be the case if the sleeve were yoked to the diaphragm. In this design the sleeve is entirely independent of the diaphragm. An equilibrium is maintained in the regulator at all times, throttling the supply when the desired pressure is built up and opening instantly when the consumption lowers the pressure and an increased supply is needed.

This regulator has been simplified in all particulars from the old design and has been reduced in size and weight. The valve seat is now subjected to much less wear and, being held in perfect alignment, it works with accuracy for many months longer than the seat of the old-style regulator.

Neither volume of gas nor accuracy of regulation has been sacrificed in simplifying the construction. On the contrary, the manufacturer claims for this regulator that it will act with more directness and regulate within closer limits, in addition to maintaining its efficiency of regulation for a longer and harder period of service.

The regulator is adapted for use with various gases by a change of the gages shown in the illustration. The rear connection is also changeable so that the regulator can be attached to various types of containers. This regulator is the invention of A. F. Jenkins, who has long been associated with the acetylene industry. It is manufactured and sold by the Alexander Milburn Co. of Baltimore, Md.

Catalogs Received

STEERE ENGINEERING Co., Detroit, Mich.—Pamphlet 246. Leaflet pointing out further information relative to this company's bulletin 39.

OXWELD ACETYLENE Co., Chicago, Ill.—How Welded Joints Solved Pipe Line Troubles. A book made up of reprints describing the use of oxy-acetylene welding equipment as used in the petroleum industry, the city gas plant, long-distance high-pressure gas transmission, and industrial piping.

THE FOXBORO Co., Foxboro, Mass.—A new issue of the Foxboro Co.'s general catalog, including many recent bulletins of this company, issued under date of April, 1923. The subjects include all types of Foxboro recording and indicating instruments.

KNAPP METAL BARREL & PACKAGE Co. OF NEVADA, San Francisco, Calif.—Leaflet describing the Knapp knock-down metal barrel with locking head.

BROWN HOISTING MACHINERY Co., Cleveland, Ohio—Catalog F. A catalog describing the new Brownhoist single roll coal crusher. Catalog M. A catalog describing the new Brownhoist belt conveyor idler.

LINK-BELT Co., Chicago, Ill.—Book 480. A new Link-Belt catalog describing the company's line of electric hoists and overhead traveling cranes. This book is well illustrated with many suggestive applications of Link-Belt hoists and cranes.

CONTINENTAL PIPE MFG. Co., Seattle, Wash.—Catalog 18. A new and very complete catalog on various types of wood pipe and flumes manufactured by this company. The book is well illustrated and contains many tables of value to the engineer.

THE ESTERLINE-ANGUS Co., Indianapolis, Ind.—Bulletin 223. A bulletin describing various new uses for the Esterline type of graphic instruments.

PENNSYLVANIA FLEXIBLE METALLIC TUBING Co., Philadelphia, Pa.—Bulletin 55-B. A new bulletin describing the "Penflex" type of all-metal heavy-duty hose and couplings for tank car unloading.

THE ROTO Co., Hartford, Conn.—A new catalog describing the Roto line of tube cleaners for boilers, economizers, condensers, evaporators, feed water heaters and other tubular equipment.

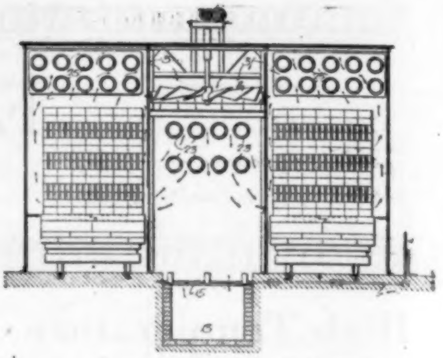
Review of Recent Patents

Developments of Interest to the Chemical Engineer

Drying, Catalysis and Crystallization Among Fundamental Processes Stressed in Recent Patent Specifications

FEW UNIT PROCESSES in chemical engineering have been more intensively studied or more extensively developed than drying. Driers have been used for many years, but until quite recently their development has been empirical. Perhaps within the last decade modern drying has come into its own. It is, therefore, with rather unusual interest that patents on drying equipment are studied. W. M. Schwartz and E. B. Ayers, of Philadelphia, have patented a tunnel drier for drying bricks and other pottery materials before they are baked in a kiln. Among other interesting features, it utilizes the waste heat from the firing kiln to dry the pottery or brick.

The principle of the drier is illustrated in the accompanying diagram. It consists essentially of three longitudinal chambers, two drying chambers on either side and an intermediate circulating chamber in the center. The drier



A NEW WASTE HEAT DRIER

is heated in two ways. In the first place, hot air from the cooling zone of the kiln comes into direct contact with the bricks as they are dried, and again the flue gases from the kiln itself are led through the drying chamber in pipes, over which circulates the air that comes in contact with the bricks and dries them. The gases from the cooling part of the kiln enter from the

American Patents Issued May 15, 1923

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States Patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.'s* staff, and those which, in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

1,454,870-871 — Nitration Apparatus and Process for Nitrating Cellulose. H. V. Walker, Newark, N. J.

1,454,873—Method of Handling Gases and Product Containing Dissolved Gas. H. C. P. Weber, Pittsburgh, Pa., assignor to Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

1,454,874—Fractionating Column. H. C. P. Weber, Pittsburgh, Pa., assignor to Westinghouse Company.

1,454,916—Means for Separating the Liquid and Solid Components of Mixtures of Liquids and Solids. A. J. Arbuckle, Johannesburg, Transvaal, South Africa.

1,454,945—Acid Receiver. P. L. Pfannenschmidt, Jena, Germany.

1,454,959-961—Cellulose Ether, Cellulose-Aralkyl-Ether and Composition Containing Cellulosic Derivatives. Henry Dreyfus, London, England.

1,455,005—Process of Producing Anhydrous Metallic Chloride. B. S. Kirkpatrick, San Pablo, and F. S. Morgan, Berkeley, Calif., assignors to Standard Oil Co. of California.

1,455,015—Soap. F. C. Atkinson, Indianapolis, Ind., assignor to American Hominy Co., Indianapolis.

1,455,016—Process of Preserving Cotton Seed. F. C. Atkinson, Indianapolis, Ind.

1,455,059—Cooling Means for Exhaust Mains. J. Van Ackeren, Pittsburgh, Pa., assignor to the Koppers Co., Pittsburgh, Pa.

1,455,060—Process of Recovering Iron Oxide and Other Products From Spent Iron Sludge. C. V. Bacon, Mahwah, N. J.

1,455,072—Dehydration of Alcohol. H. E. Buc, Roselle, N. J., assignor to the Standard Development Co.

1,455,088 — Electrically Operating Treating Chamber for Hydrocarbon Vapors and Gases. J. L. McCabe, Wichita, Kan.

1,455,139—Electric Dehydrator. F. W. Harris, Los Angeles, Calif., assignor to the Petroleum Rectifying Co., San Francisco.

1,455,156—Apparatus for Refrigeration. R. A. Willson, Spokane, Wash., assignor of one-half to F. N. Martin, Spokane.

1,455,181—Furnace Gas Producer. C. E. Wentzel, Dayton, Ohio, assignor to International Clay Machinery Co., Dayton.

1,455,200—Insulating Composition for Electrical Apparatus. F. J. Groten, Jr., Meriden, Conn., assignor to Conn. Tel. & Elec. Co., Meriden.

1,455,238—Drying Appliance. H. J. Bosch, New York.

1,455,254—Utilization of Edible Fats. M. Kahn, New York, assignor to Intraven Co., New York.

1,455,263.—Method and Apparatus for Testing Gaseous Mixtures. G. Oberfell, Tulsa, Okla.

1,455,264—Easily and Neutrally Soluble Double Compounds of 1-Allyl-3,7-Dimethyl Xanthine. E. Preiswerk, Basel, Switzerland, assignor to the Hoffman-La Roche Chemical Works, New York City.

1,455,284—Burning Sulphur. H. S. Davis, Pittsburgh, Pa., assignor to Texas Gulf Sulphur Co., New York City.

1,455,299—Method of Evaporating Ammonia Liquor. F. F. Marquard, Clairton, and C. W. Littler, Swissvale, Pa.

1,455,309—Propulsive Blasting Explosive. A. J. Strane, St. Paul, Minn., assignor to the Atlas Powder Co., Wilmington, Del.

1,455,376-7—Process of Converting Oils and Apparatus Therefor. J. H. Adams, Flatbush, N. Y., assignor to the Texas Co., Houston, Tex.

1,455,392 — Apparatus for Drying Charges for Shaft Furnaces. E. Diepschlag, Breslau, Germany.

1,455,414—Absorbing and Purifying Composition. J. C. Tate, Oakland, Calif.

1,455,436 — Art of Filtration. G. H. Field, Culver, Ind., assignor to Standard Oil Co., Whiting, Ind.

1,455,437—Petroleum-Distillation Process. V. T. Gilchrist, San Francisco, Calif., assignor to Superior Process Refining Co., San Francisco.

1,455,448—Process of Manufacture of Diphenylenediketones From Anthracene Compounds. G. Peters, Worms, Germany.

1,455,456—Ball Mill. L. L. Sweet and M. Morley, Wallace, Idaho.

1,455,469—Method of and Apparatus for Separating Coal and Like Substances and Impurities Mingled Therewith. W. D. Althouse, Philadelphia, Pa.

1,455,471—Method of Preparing Pulp. C. Bache-Weig, Portland, Me.

1,455,436-7-8—Dyes of the Acridine Series and Their Manufacture (2 patents). Dyes of the Benzene-Napthalene-Acridine Series and Their Manufacture. H. Grünhagen, Berlin, Germany, assignor to the Chemical Foundation, New York City.

1,455,495 — Mercury Derivatives of Aromatic Compounds and Process of Making Same. A. Klages, Magdeburg-Südost, Germany, assignor to the Chemical Foundation, New York City.

1,455,505—Filtering Apparatus. W. Paterson, London, England.

1,455,508—Process of Making the Chlorinated Products of Methane. E. H. Riesenfeld, Freiberg, Germany, assignor to the Chemical Foundation, New York City.

1,455,509—Method of Refining Mixtures of Chlorides of Napthalenes Serving as Substitutes for Rosin. K. Rucker, Berlin, Germany, assignor to the Chemical Foundation, New York City.

1,455,527—Coke Oven. P. Goffart, Brussels, Belgium, assignor to the Belgian-American Coke Ovens Corp., Wilmington, Del.

1,455,544—Rubber or Rubber-Coated Article. L. Minton, Manchester, England.

1,455,546—Process of Treating Bitumen or Cellulose-Containing Substances. I. Moscicki, Lwow, Poland.

1,455,594—Process of Treating Paper Stock. F. P. Miller, Downington, Pa.

1,455,598—Aromatic Hydrocarbon Cement. W. S. Barrie and L. Chadwick, Selwyn, Queensland, Australia.

1,455,630 and 679—Preparation of Starch and Sulphuric Acid. J. A. Lloyd, Coventry, England, assignor to Courtraulds, Ltd., London.

1,455,642—Still. J. M. Mahoney, Houston, Tex.

1,455,655—Process of and Means for Tanning Hides. V. Peradotto, Gallenca, Turin, Italy.

1,455,707—Recovery of Ether. J. H. Brégeat, Paris, France, assignor to Brégeat Corporation of America, Wilmington, Del.

1,455,728—Process for the Removal of Water From Colloidally Dissolved Substances Such as Crude Peat, Coal Sludge and the Like. H. Horst, Uerdingen, Germany, assignor to Gesellschaft für Maschinelle Druckentwasserung metbeschränkter Haftung, Uerdingen, Germany.

1,455,762—Process of Recovering Cork and Other Products From Bark. G. C. Howard, Seattle, Wash.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

floor of the circulating chamber by means of dampers, which can be regulated, and mix with the air that is being circulated by means of fans at the top of the circulating chamber. The accompanying diagram illustrates a cross-section of the kiln and shows the flue underneath the floor of the circulating chamber, through which the air is admitted to the drier. It also shows the pipes 23 and 25 which contain the flue gases from the kiln.

Bricks are loaded on cars that are pushed through the tunnel drier by means of a hydraulic ram, both sides being operated at the same time. The diagram does not show deflectors which control the flow of gases nor the stacks and headers by which the flue gases are led from the kiln through the drying chamber in pipes and on to the stacks. This is described in Patent 1,451,589, issued April 10, 1923, and assigned to Proctor & Schwartz of Philadelphia.

A Useful Idea in Producing Halogen Acids

When silicon tetrachloride is treated with water, silicic acid and hydrochloric acid are formed. This, however, does very little good in the manufacture of hydrochloric acid, because the silicic acid comes down as a gelatinous precipitate, which is practically impossible to handle on a commercial scale. On the other hand, this reaction might be useful if it took place at a temperature above the dehydrating point of silicic acid. Then the material would come down in a dry state and the hydrochloric acid would be evolved as a gas. This is substantially the process patented by F. S. Low of Niagara Falls and assigned to the Weaver Co. of Madison, Wis. In carrying it out, he suggests vaporizing the silicon tetrachloride with a blast of steam. The reaction then takes place in a chamber in which the temperature is kept well above the dehydrating point of silicic acid. The silica drops to the bottom and may be removed by means of a hopper, whereas the hydrochloric acid vapor is evolved through a system in which appropriate absorption can take place. (1,451,399, issued April 10, 1922.)

A Continuous Crystallizer

Another patent is interesting, as it involves a principle that is coming to the fore more and more—that of continuous crystallization of particles having a definite size. The crystallizer of Truman E. Stevens of Omaha, Neb., contains scrapers made of large wire or heavy bristle brushes. The fine crystals are thus formed on the surface of the tank, which is cylindrical, and are immediately brushed off by the brushes. This keeps the tank free from an insulating layer, allows rapid cooling, and feeds the whole tank with fine crystals which grow to larger crystals as they travel to the bottom of the crystallizer, where they may be removed through an appropriate chute. (1,450,992, issued April 10, 1923, and assigned to Potash Reduction Co., Hoffland, Neb.)

Catalysts Improved by Grinding

Metallic nickel used as a catalyst in the hydrogenation of fatty acids and their esters and glycerides can be produced by treating a nickel salt with metallic zinc, but the resulting nickel is only weakly catalytic. If, however, the zinc is used in granular form and the reaction takes place under grinding conditions, as for example in a ball mill, the resulting nickel powder has a very much higher catalytic activity. This process was patented by George A. Richter, and assigned to the Brown Co. of Berlin, N. H. (1,451,113, issued April 10, 1923.) It is further noted in this patent that nickel which is produced from nickel sulphate has a higher activity than that produced from nickel chloride. The precipitated nickel is settled out and is washed free from zinc salt solution, after which it is dried in an inert atmosphere or under vacuum.

Trend of Invention in the Paint and Varnish Industries

Byproduct Recovery and Special Paints and Enameling Compositions Are the Subject of Late Patent Developments

AT LEAST six of the many patents issued during the month of March and April are of interest to the paint and varnish industries. Paul W. Webster, of Perry & Webster, New York, has described an oxidizable oil that can be recovered from the fume-collectors over paint and varnish heating kettles. The product he obtains is useful as a froth-producing material to be used in the flotation process. A non-corrosive paint consisting essentially of ferric oxide, zinc oxide and copper oxide is the subject of a patent by A. C. Tutt and Levi F. Snelson. A pure white paint "of a lasting, permanent nature which will be proof against the action of fire, acid, sun, water and rust" is specified in a similar patent by John T. Lawrence. Two of the patents refer to varnish gums. James McIntosh has patented a synthetic gum made by the condensation of a phenolic body with a ketone. Carleton Ellis' patent relates to a paint the vehicle of which contains cumaron resin. This paint dries to a flat or dull surface in contrast with the glossiness of ordinary paint. Herman F. Willkie, of the U. S. Industrial Alcohol Co., has obtained a novel enameling composition containing pyroxylin, which, although applied as a single coat, dries to form a dense opaque surface, very much like the highly glossed surface obtained with varnish.

Recovering a Marketable Byproduct

In paint and varnish manufacture various types of drying oils, such as linseed, tung, china wood and soya bean oils, are boiled together with the resins, gums and pigments in kettles, which are usually provided with fume-collection equipment. These fumes given off consist of various vapors and volatile oils, together with some comparatively permanent gases. Examination of these fumes has shown that they contain an oil distillate that may be separated by condensation. The condensers consist of tubes cooled by means of air or various liquid refrigerants. By drawing air into the condensing tubes the distillate is oxidized during the time it is condensing. The stable liquid obtained from these condensers is an air-drying fatty oil, with a condensing point below 75 deg. F. (1,447,954, issued March 6, 1923.)

Non-Corrosive and Special Paints

An example of the non-corrosive paints obtained by Tutt and Snelson is made by mixing 70 parts of dry ferric oxide, 10 parts of dry zinc oxide and 10 parts of copper oxide and thoroughly incorporating them with about 60 parts of raw linseed oil. Small quantities of either waste or reclaimed rubber and of raw amber are also incorporated with the oil and form a part of the paint. The rubber gives an adhesive quality, while the amber supplies the gloss. (1,448,284, issued March 13, 1923.)

The formula for the paint made by Lawrence is as follows: Poppy seed oil 80 parts, barium sulphate 12 parts, sodium carbonate 12 parts, prepared white zinc oxide 24 parts, white lead 12 parts, zinc sulphate 16 parts, silica 12 parts, ground white antimony 6 parts, commercial yellow rosin 6 parts, and water-white rosin 6 parts. All of the ingredients except the rosin are mixed together at approximately 600 deg. F. for about half an hour. The non-corrosive properties of this paint are claimed to apply for both wood and metal surfaces. (1,450,688, issued April 3, 1923.)

Synthetic Gum and Cumaron

The patent on synthetic gum, which is assigned to the Diamond State Fibre Co., provides for the condensation of phenol, or a phenolic body, with a ketone such as acetone or methylethylketone, in the presence of sulphuric acid, bromine, sulphur, pyridine, or any other suitable catalytic agent. The resulting gum after it has condensed to a solid form is placed on an oven and subjected to a temperature of from 120 to 130 deg. C. for from 10 to 12 hours. A yellow or orange gum having a melting point of about 80 deg. C. and a high luster is obtained which is especially valuable as a shellac substitute. It is soluble in alcohol, benzol, acetone and most other organic solvents, although it is insoluble in water. (1,448,566, issued March 13, 1923.)

The patent by Carleton Ellis provides

for the use of a 33 to 45 per cent solution of hard cumaron resin (m.p. 90 deg. C.), which is mixed with 5 lb. lithopone and put through a paint grinder. This paint thus obtained when applied to a wooden or other surface dries to a flat finish. For a red color, iron oxide may be used instead of lithopone, the following proportions being necessary: 225 lb. mineral red, 57 lb. cumaron resin and 80 lb. heavy benzine. The use of various other pigments, such as ocher, umber and brunswick green, may be desirable in order to obtain a variety of colors. (1,451,092, issued April 10, 1923.)

Pyroxylin Enameling Composition

The object of the patent by Willkie was to provide a composition that would give an enameled surface, similar to varnish, by the application of a single coat. The enameled coating obtained by this composition, although it is applied as a single coating, is in reality made up of a lower layer of a dense opaque character and an upper varnish-like layer that gives the coated surface a high gloss. A cellulose ester such as pyroxylin is dissolved in a solvent mixture made up of 75 per cent by volume of ethyl alcohol having a strength of approximately 90 per cent, 23.75 per cent of anhydrous ethyl acetate and 1.25 per cent of diethyl phthalate. The last named is the so-called high-boiling solvent and it remains in the upper part of the hardened film as a latent solvent of the cellulose ester, thus cementing together the particles of precipitated ester, which form the lower layer of the coating.

It is pointed out that other cellulose esters, such as cellulose acetate, may be used and that the ethyl acetate and alcohol may be replaced by various solvents such as acetone, methyl acetate, etc. Furthermore, the diethyl phthalate may be replaced by various other compounds, such as ethyl aceto acetate, triacetin, etc. (1,449,157, issued March 20, 1923, and assigned to U. S. Industrial Alcohol Co.)

Synopsis of Recent Literature

Foundations and Floors

The subjects of foundations, floors and ceilings is a highly important one to the executive who contemplates industrial building. G. L. H. Arnold, in his series on "Buildings From the Manager's Viewpoint," in *Management Engineering* for May, 1923, points out that good foundations properly supported, floors of ample strength and ceilings free from obstructions are prime requisites of the good factory building.

Foundations — The foundation must first be strong enough to bear the building load. It must be supported in such a way that settlement is reduced to a minimum and cracking prevented. To attain this latter point bearing surfaces must be ample and, if the soil is poor in bearing qualities, piling must be used. Finally, foundations must be properly waterproofed to a point well above the water line.

Floors — The points to consider in flooring, after the prime one of adapting the floor material to the type of manufacture to be conducted in the building, are:

1. It should be smooth, and free from nails, bolts and other projections; also from holes and splinters.
2. It should be dry, of low heat conductivity, durable, and easily cleaned.
3. It should be constructed strongly enough to bear at least four times the static load, and six times the moving load which may be placed upon it.
4. It should be as nearly noiseless as possible. Noisy floors may wear well, but the noise of the feet, truck wheels and machinery irritates the workmen.
5. It should not be slippery, nor made of material which will wear slippery.
6. Regular inspection of floors should be made and defects repaired promptly.

Ceilings—Lighting and the probable requirements for pipes, shafting and belts will be the important factors to be considered in connection with the ceilings. For lighting purposes the flat slab ceiling is best, while if much piping and shafting is to be run the beamed type with its smaller column heads is better. In general, a proper compromise must be made to suit the particular industry.

Seaboard Liquid Purification Process

An answer to the paper of R. H. Broker, recently published by *Gas Age-Record* and synopsized in these pages, from the pen of F. W. Sperr, Jr., of the Koppers Co., appears in *Gas Age-Record* for May 19. Mr. Sperr says in part:

The paper by Mr. Broker is to be welcomed as a frank statement of the difficulties likely to be encountered by a gasworks management which undertakes to design and build its own liquid purification plant. It should perhaps have been stated plainly in the paper that, at the request of the Racine management, the design and construction of the plant were done by themselves locally; but doubtless Mr. Broker intended that this should be brought out in the discussion. In fairness to the "Seaboard process," it should be emphasized that there are five other plants in operation using the process under all sorts of conditions, and that these are all operating with a high degree of efficiency and to the satisfaction of their owners.

From the local conditions at Racine,

Important Articles In Current Literature

More than fifty industrial technical or scientific periodicals and trade papers are reviewed regularly by the staff of *Chem. & Met.* The articles listed below have been selected from these publications because they represent the most conspicuous themes in contemporary literature, and consequently should be of considerable interest to our readers. Those that are of unusual interest will be published later in abstract in this department; but since it is frequently impossible to prepare a satisfactory abstract of an article, this list will enable our readers to keep abreast of current literature and direct their reading to advantage. The magazines reviewed have all been received within a fortnight of our publication date.

MITSCHERLICH PULP. Arthur S. M. Klein. *Paper Trade Journal*, May 17, 1923, Technical Section, pp. 180-184.

FINDING STEAM LOSSES FROM STEAM COSTS. S. H. Childs. *Paper Trade Journal*, May 17, 1923, Cost Section, pp. 52-53.

DENATURED ALCOHOL IN CANADA. Ross E. Gilmore. *Canadian Chemistry and Metallurgy*, May, 1923, pp. 116-118.

CANADA'S CHEMICAL TRADE. S. J. Cook. *Canadian Chemistry and Metallurgy*, May, 1923, pp. 135-138.

TURPENTINE. G. H. Pickard. *American Paint Journal*, May 14, 1923, pp. 18-22.

THE ELECTRON IN CHEMISTRY. Sir J. J. Thomson. *Journal of the Franklin Institute*, May, 1923, pp. 593-620.

HIGH TEMPERATURE INVESTIGATION. E. F. Northrup. *Journal of the Franklin Institute*, May, 1923, pp. 665-686.

STAINLESS STEEL. *Engineering*, May 4, 1923, p. 550.

SOME EFFECTS OF ZIRCONIUM IN STEEL. F. M. Becket. *Iron Age*, May 10, 1923, p. 1321.

SURFACE COMBUSTION. W. A. BONE. *Engineering*, May 11, 1923, p. 594.

THE DESIGN OF HOT-AIR DRYING PLANT. George H. Gill. *Engineering* (London), May 4, 1923, pp. 541-542.

SEABOARD LIQUID PURIFICATION PROCESS. F. W. Sperr, Jr. *Gas Age-Record*, May 19, 1923, pp. 639-640.

RINCKER COMPLETE GASIFICATION PLANT. *Gas Age-Record*, May 19, 1923, pp. 637-638.

LES APPLICATIONS INDUSTRIELLES DE LA CATALYSE EN CHIMIE ORGANIQUE. A. Mailhe. *La Technique Moderne*, May 1, 1923, pp. 257-264.

inferences are drawn by Mr. Broker against the efficiency of the process. At present writing, one of the five other plants is removing 82 per cent of the hydrogen sulphide in the gas; the others are removing from 90 to 95 per cent of the hydrogen sulphide. All of these plants are removing 90 per cent or more of the hydrocyanic acid in the gas. In the case of the single plant with 82 per cent efficiency of H_2S removal, changes will be made which will increase this to 90 per cent. For plants which it designs and builds the Koppers Co. is willing to guarantee an efficiency of at least 85 per cent.

The only other important point raised by Mr. Broker is the question of the odor of the actifier air. There has been no disposition on the part of the Koppers Co. to minimize this.

The expedient of burning the actifier air, as practiced at Battle Creek, is undoubtedly the surest way of avoiding complaint; but in certain cases the Koppers Co. has recommended dilution, and with ample ground, in spite of Mr. Broker's statement. One plant located in the midst of an important business district and close to offices and dwellings has employed dilution for nearly a year as the sole method of disposal of the actifier air, and has had no complaint and no indication of objectionable odor. Three other plants located farther away from business or residence district discharge the actifier air directly into the atmosphere and have had no complaint.

The height of the point of discharge above the ground is undoubtedly important; and with a sufficiently high stack, dilution may in many cases be the most satisfactory means of getting rid of the actifier air. It should be brought out in this connection that when the Racine plant was first started they had a wooden stack only 30 to 35 ft. high—in fact, not so high as the purification tower. It was during this period that practically all of the odor trouble occurred.

Men in the Profession

R. F. BOWER, a statistical expert in fertilizers and fertilizer materials, has been appointed to assist in the nitrate studies of the Department of Commerce. Mr. Bower will give particular attention to the agricultural demands for nitrogen.

C. G. DARWIN, grandson of Charles Darwin, recently addressed the Southern California Section of the American Chemical Society, at Los Angeles, on "The Periodic System." Mr. Darwin has been appointed to the new Tait chair of natural philosophy at Edinburgh University.

J. WALTER DRAKE, an automobile manufacturer of Detroit and a native of Sturgis, Mich., has been selected to fill the vacancy in the office of the Assistant Secretary of Commerce created by the resignation of Claudius H. Huston.

A. C. FIELDNER, supervising chemist and superintendent of the Bureau of Mines Experiment Station, Pittsburgh, Pa., gave a lecture before the Mining Society of Pennsylvania State College, State College, Pa., May 4, on "The Constitution of Coal."

L. W. HIMMLER has resigned as assistant chemist in the Dairy Division, Bureau of Animal Industry, at Washington, D. C., to join the research staff of the Cudahy Packing Co., at Omaha, Neb.

S. P. HOWELL has been assigned to work in connection with the field investigation of liquid oxygen explosives for the Bureau of Mines.

RAYMOND B. LADOO, mineral technologist of the Bureau of Mines, has resigned that position to go with the Southern Mineral Co., Washington, D. C. He will devote his attention to the development work in connection with the non-metallic minerals in the Southern states.

ERIC A. LOF, who since 1909 has been connected with the power and mining engineering department of the General Electric Co. as industrial engineer and specialist, has resigned to take up work with the American Cyanamid Co., with headquarters in New York City. He will assume his new duties June 1.

RONIER D. OILAR, chemical engineer, returned recently from a trip to South America, having spent a little over a year in development and investigational work on vegetable oil, soap and packing-house industries in Peru and several other countries.

BRADLEY STOUGHTON, formerly secretary of the American Institute of Mining and Metallurgical Engineers and more recently consulting engineer, will, beginning next fall, be professor of metallurgy at Lehigh University, Bethlehem, Pa.

Obituary

HENRY WOODLAND, secretary and treasurer of the Allis-Chalmers Manufacturing Co., died suddenly at his home in Milwaukee, May 14. Born in Utica, N. Y., Mr. Woodland at an early age became connected with the New York Air Brake Co. of Chicago. When in 1901 this company was taken over in the consolidation which formed the Allis-Chalmers company, he became assistant treasurer of the new organization and afterward its treasurer. In 1916 he was elected secretary and treasurer. At the time of his death he was also vice-president and a director of the Hanna Engineering Co. of Chicago.

New Publications

NEW BUREAU OF STANDARDS PUBLICATIONS: Circ. 42, Tables of Thermodynamic Properties of Ammonia; Tech. Paper 235, Thermal Stresses in Steel Car Wheels, by George K. Burgess and G. Willard Quick.

UNIV. OF ILLINOIS BULLETIN 136, "An Investigation of the Fatigue of Metals, by H. F. Moore and T. M. Jasper.

A COMPARISON OF BRITISH AND AMERICAN FOUNDRY PRACTICE, with special reference to the use of refractory sands, by P. G. H. Boswell. Published by the University Press of Liverpool, Ltd., Liverpool, England. Price 4s. 6d.

CENTENARY OF THE ALKALI INDUSTRY. A well-illustrated volume recording a century of progress in the British alkali industry.

NEW BUREAU OF MINES PUBLICATIONS: Bull. 201, Prospecting and Testing for Oil and Gas, by R. E. Collom; Bull. 202, Electric Brass Furnace Practice, by H. W. Gillett and E. L. Mack; Bull. 211, The Chloride Volatilization Process of Ore Treatment, by Thomas Varley, E. P. Barrett, C. C. Stevenson and Robert H. Bradford, with an introductory chapter by Stuart Croasdale; Bull. 213. Talc and Soapstone, Their Mining, Milling, Products and Uses, by Raymond B. Ladoo; Bull. 218, The Technology of Slate, by Oliver Bowles; Tech. Paper 279, Economic Combustion of Waste Fuels, by David Moffat Myers; Tech. Paper 287, Preparation of Light Aluminum-Copper Casting Alloys, by R. J. Anderson; Tech. Paper 300, The Universal and the Fireman's Gas Masks, by S. H. Katz, J. J. Bloomfield and A. C. Fieldner; Tech. Paper 301, Proposed Method for Reducing Mineral Waste in the Wisconsin Zinc District, Wisconsin, by Will H. Coghill and C. O. Anderson; Tech. Paper 323, Specifications for Petroleum Products and Methods for Testing; Tech. Paper 325, Natural-Gas Manual for the Home, by R. A. Cattell; Bull. 210 (issued from Bureau of Mines, Denver Colo.), Oil-Shale a Historical, Technical and Economic Study, by Martin J. Gavin.

Calendar

AMERICAN ASSOCIATION OF CEREAL CHEMISTS, ninth annual convention, Hotel Sherman, Chicago, June 4 to 9.

AMERICAN CHEMICAL SOCIETY, fall meeting, Milwaukee, Wis., Sept. 10 to 14.

AMERICAN CHEMICAL SOCIETY, New York Section, regular meeting, Rumford Hall, Chemists' Club, June 8.

AMERICAN ELECTROPLATERS SOCIETY, eleventh annual meeting, Providence, R. I., July 2 to 5.

AMERICAN GAS ASSOCIATION, annual convention, Atlantic City, Oct. 15 to 20.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, summer meeting, Wilmington, Del., June 20 to 23.

AMERICAN LEATHER CHEMISTS ASSOCIATION, twentieth annual convention, Greenbrier, White Sulphur Springs, W. Va., June 7, 8 and 9.

AMERICAN PULP AND PAPER MILL SUPERINTENDENTS ASSOCIATION, annual meeting, Springfield, Mass., May 31 to June 2.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, spring meeting, Montreal, Canada, May 28 to 31.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS, iron and steel exposition, Buffalo, N. Y., Sept. 24 to 28.

AMERICAN SOCIETY FOR TESTING MATERIALS, twenty-sixth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 25 to 30.

CANADIAN INSTITUTE OF CHEMISTRY, annual meeting, Toronto, May 29 to 31.

INSTITUTE OF MARGARIN MANUFACTURERS, fourth annual convention, Hotel Traymore, Atlantic City, June 14 and 15.

NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES (NINTH), New York, Sept. 17-22.

NATIONAL FERTILIZER ASSOCIATION, thirtieth annual convention, White Sulphur Springs, W. Va., June 11 to 16.

NATIONAL LIME ASSOCIATION, fifth annual convention, Hotel Commodore, New York City, June 13 to 15.

SOCIETY OF CHEMICAL INDUSTRY, Canadian Section, Toronto, May 29 to 31.

SOCIETY FOR STEEL TREATING, Eastern sectional meeting, Bethlehem, Pa., June 14 and 15.

TAYLOR SOCIETY, Hotel Onondaga, Syracuse, N. Y., June 7 to 9.

Industry and Trade

Current News and Market Developments

Summary of the Week

Oliver Bowles, mineral technologist, appointed to head new non-metals experiment station of Bureau of Mines at Rutgers College.

Brief course in chemical engineering planned for benefit of students attending Ninth Annual Chemical Industries Exposition.

Lehigh engages Bradley Stoughton as professor of metallurgy.

Importers are carrying heavy stocks of chemicals and are finding it difficult to maintain prices.

Report from Washington states that annual coal-tar census will soon be ready for publication.

Official import figures for February show that arrivals of chemicals for that month suffer in comparison with totals for corresponding period last year.

Tariff Commission is considering establishment of a permanent staff in foreign countries.

Report from Germany casts doubt on belief that importers of coal-tar products will secure regular shipments from that country.

Imported caustic potash offered freely with prices gradually working lower.

Lower prices for tin have resulted in a 2c. per lb. decline in tin oxide.

Bureau of Census figures on cottonseed products brought about higher prices for cottonseed oil.

C. P. glycerine unsettled on freer offerings from midwest producer.

Turpentine lowered in price as result of large receipts at southern terminals.

Phenol offered in a larger way by second hands and at reduced prices.

Heavy arrivals of crude naphthaline from abroad and lower cables from foreign centers created easier feeling.

Yellow prussiate of soda offered at reduced prices for June delivery with spot market also easier.

German Coal-Tar Industry Affected by Lack of Fuel and Raw Materials

Majority of Producing Plants Located in Occupied Territory—Coal Shortage Closing Works

"THE statement of leaders of the German coal-tar dyes industry that, by reason of stocks on hand either at the works or with dealers in that country or abroad, Germany is probably able to supply demands for the next 6 months should be taken with reserve," declares William T. Daugherty, assistant trade commissioner of the United States at Berlin, in a report to the Department of Commerce dated April 5, 1923.

It is estimated that 80 per cent of the total production of coal-tar dyes, considered alone, is located in occupied territory, the report states, and plants have had difficulty in securing fuel and raw materials owing to refusal to pay the tax imposed by the occupational authorities. The main seats of five of the eight concerns in the "Interessengemeinschaft" of the German coal-tar dyes industry, which pool is practically a monopoly of that industry in Germany, are in occupied territory. Four of the large plants have been seized by the French and Belgians since the trade commissioner's report was prepared.

It has also been estimated, the report states, that 50 per cent of Germany's total production of pharmaceuticals, considered alone, is likewise located in occupied territory.

When the report was prepared, it was reported that the works on the upper Rhine belonging to the Badische were having difficulties in getting fuel. The Badische plant at Ludwigshafen was said to be virtually closed, while its other plants were embarrassed by a coal shortage. Fresh supplies were said not be forthcoming on account of the operators refusing to pay the French export tax. The Hoechster works were reported to be operating in very limited measure; while the same applied to the works of Bayer, at least in its works at Elberfeld, although its Leverkusen plant, in the English zone, was reported in a more favorable position. The Leverkusen works was said to be using brown coal, mined within English-occupied territory.

The report gives figures showing the decline in exports of German coal-tar dyestuffs, largely due, it is said, to development of the industry in the United States. In metric tons, these figures show that in 1913 exports from Germany of anilin and other tar dyes were 64,288; in 1920, 17,899; in 1921 (8 months only), 14,308; in 1922, 36,011. In 1913 exports of alizarin dyes from anthracene were 11,040 metric tons; in 1920, 3,325; in 1921 (8 months only), 1,570 and in 1922, 1,777 metric tons. In 1913, exports of artificial indigo were 33,353 metric tons; in 1920, 6,509; in 1921 (8 months only), 6,033; and in 1922, 13,828 metric tons.

Dr. Albert Neuburger in a leading article in *Chemiker Zeitung* of April 5 discussed the effect upon the chemical industry of occupation of the Ruhr and urged more general employment of known processes to recover combustible substance from the slag waste from the firing process as one means of overcoming the coal shortage.

The Ruhr occupation has caused German interests to view with pessimism the prospects of producing synthetic nitrogen this year, as first proposed to help overcome the domestic food shortage, Mr. Daugherty reports. The Oppau works shut down about April 1 because of coal shortage and had been credited with a production of 75,000 tons of nitrogen, or about 22 per cent of the total estimated production possible. The needs of German agriculture alone are estimated at between 420,000 and 600,000 tons of nitrogen annually. Under normal conditions and with proposed extensions, it is estimated that production could be increased 50,000 tons a year, and in 5 years the maximum demand could be filled. Despite encouragement of imports, little saltpeter was imported from Chile last year.

Mines Bureau Opens Non-Metal Station With Oliver Bowles as Director

New Brunswick, N. J., Selected as Home for New Experiment Station, Due to Central Location and Available Facilities

RUTGERS College, New Brunswick, N. J., has recently been designated by the Secretary of the Interior as the location for the new non-metal experiment station of the Bureau of Mines.

Oliver Bowles, the mineral technologist, who has been in immediate charge of the bureau's work on the non-metals, has been selected to be superintendent of the new experiment station. Mr. Bowles is a Canadian by birth, but has been continuously engaged as an educator and government specialist in this country since 1908. In 1908 and 1909 he served the University of Michigan as an instructor in petrography. For the 4 years following, he taught geology and mineralogy at the University of Minnesota. He joined the staff of the Bureau of Mines in 1914 as a quarry technologist and since 1917 has been the mineral technologist for the Chemical Division of the bureau.

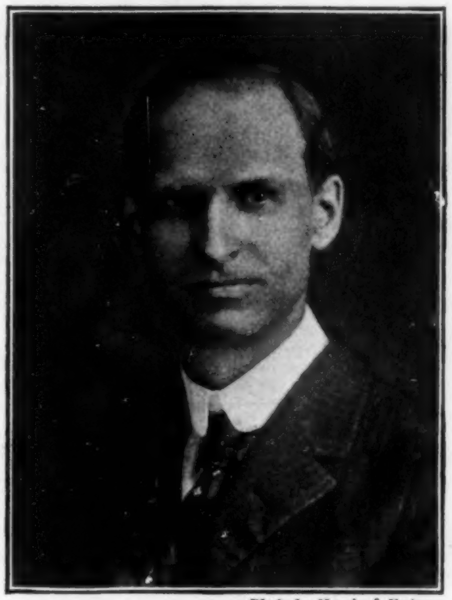


Photo by Harris & Ewing

OLIVER BOWLES

The new station will specialize in problems involved in the production and utilization of the non-metallic minerals. Of these minerals the most important at present are bauxite, cement, clay, feldspar, fullers earth, graphite, gypsum, lime, mica, phosphate rock, salt, sand and gravel, sand-lime brick, slate, stone, sulphur, mineral paints, garnet, asbestos and talc. The value of these non-metallic minerals produced annually in the United States is in the neighborhood of a billion dollars.

Before recommending a location for this station, a very careful survey of the entire country was made by the Bureau of Mines. New Brunswick finally was chosen because nearly all of the talc output of the country is produced in the North, as is two-thirds of the feldspar, three-fourths of the silica, nine-tenths of the slate and three-fourths of the building stone. In addition, the gypsum, refractories, fluxing stone, monumental stone and dolomite output is confined almost entirely to the North. This makes New Brunswick a very central location with reference to the production and consumption of the non-metallic minerals. The total production of non-metals north of the Potomac is $245,000,000 and $92,000,000 south of the Potomac. The adjacent state of Pennsylvania, alone, has one and seven-tenths times as great a production of non-metallic minerals as have all of the states south of the Potomac and Ohio rivers combined.

Bradley Stoughton to Join Lehigh Staff

Bradley Stoughton, inventor of furnaces used in steel plants, writer on metallurgy and engineering, until recently secretary of the American Institute of Mining and Metallurgical Engineers and a prominent New York consulting engineer, has been appointed professor of metallurgy at Lehigh University. He succeeds in this capacity Prof. Joseph W. Richards, who died Oct. 12, 1921.

Mr. Stoughton has had teaching experience, for he was for some years acting head of the department of metallurgy at Columbia University. He has been connected with the Illinois Steel Co., the American Steel & Wire Co. and Benjamin Atha & Co., Newark, N. J. He became a consulting engineer in 1902.

Centrifugal Study Planned by Bureau of Mines

The advisability of taking up intensive research in connection with the use of centrifugal force in the concentration of ores, the thickening of pulp and the dewatering of various mill products is being considered by the Bureau of Mines. Before taking this step, however, bureau officials are anxious to get in touch with other investigators.

There is full recognition on the part of the bureau specialists of the difficulties on the mechanical side of centrifugal operations as well as of the other obstacles that must be surmounted. However, in view of the great advantages that would follow the successful application of this great force to the treatment of ores, there is a definite inclination to enter upon research along these lines.

Smaller Rosin Carry-Over Into New Crop Year

Turpentine Stocks, However, Are Larger Than in Preceding Statistical Period

The annual canvass of the stocks of turpentine and rosin on hand at the end of the crop year, which closed March 31, has been completed by the Bureau of Chemistry of the Department of Agriculture. The totals, as shown in the canvass, include supplies of turpentine and rosin held by and en route to factors, dealers and jobbers—but not consumers—at the primary ports and the important distributing points of the country.

The figures are shown in the following table:

	Turpentine Casks	
	April 1, 1923	April 1, 1922
Southern primary ports	21,040	24,099
Eastern ports	2,652	1,675
Central distr. points	10,881	8,195
Western points	2,225	900
Total stocks	36,798	34,869
	Rosin, Round Bbls.	
	April 1, 1923	April 1, 1922
Southern primary ports	278,414	349,730
Eastern ports	8,078	11,359
Central distr. points	46,938	49,043
Western points	1,340	6,447
Total stocks	334,770	416,579

In order to be more complete, the figures for stocks at the Southern primary ports include the total receipts during the first week of April at Savannah, Jacksonville and Pensacola, and an estimate of the same for the other ports, as representing, as nearly as can be judged, the quantity of turpentine and rosin which had already left the stills on April 1 and was en route to the ports. This material would not be included in the stocks held by producers at the stills, which will be shown in a later report. The figures which have thus been added in are as follows: for Savannah, 825 casks turpentine and 2,554 bbl. of rosin; for Jacksonville, 1,318 casks turpentine and 9,332 bbl. of rosin; for Pensacola, 290 casks turpentine and 1,499 bbl. of rosin; for Brunswick, Mobile and New Orleans, a total of 400 casks turpentine and 1,200 bbl. rosin.

German Potash Production at Minimum Capacity

Germany's potash properties are being worked at the minimum capacity allowed by law. Much of the work is confined to development. One of the government's consulting specialists, who has just returned from Germany, is convinced that the potash interests are sincere in their desire to reduce the price of potash to the point where its use will be greatly extended.

Under present conditions the German nitrogen plants are finding it extremely difficult to compete successfully with nitrate of soda from Chile. As a result production of synthetic nitrogen has been greatly reduced, this specialist reports.

Chemical Imports in February Fall Far Below January Totals

Coal-Tar Chemicals Did Not Share in Decline—Arrivals of White Arsenic Also Larger Than in January

IMPORTS of free list chemicals and allied products in February were valued at $6,954,847. The total value of those imports on the dutiable list was $2,629,664. This is a decided falling off from the January figures, when the value of free list imports was $9,155,648 and of dutiable imports $3,584,225.

The general decrease in imports did not apply to the coal-tar chemicals. In fact, there was a slight increase in that total. In February these imports at all ports were valued at $1,193,361. In January, the total was $1,168,438. There was a decrease, however, in colors, dyes, stains, color acids and color bases. The February total was 200,094 lb., a decrease of 185,000 lb. as compared with January.

Imports of paints, pigments and varnishes during February were valued at $217,104. This is more than $100,000 less than the value of January imports. The February imports of fertilizers aggregated 142,350 tons, a reduction of more than 50,000 tons as compared with January.

One of the few items showing an increase was that of creosote oil. During February 5,530,443 gal. of that commodity was brought into the country, a very material increase over January, when imports totaled 3,826,789 gal. The steady increase in imports of white arsenic continued during February, when the total brought from other countries reached 2,115,339 lb. In January the total imported was 1,879,639 lb. There was a decided upturn in sulphuric acid imports in February, when the total reached 2,895,670 lb., as compared with 1,340,780 lb. in January.

The February imports of cyanide of potash amounted to 525,433 lb., an increase of 300,000 lb. over January. Even a more decided increase took place in the imports of sodium cyanide. The February total reached 2,633,133 lb., or 650,000 lb. more than was imported in January.

The figures are those of the Bureau of Foreign and Domestic Commerce. Their compilation has been delayed since the enactment of the new tariff bill.

High-Grade Fertilizer Used This Season

Reports from the nineteen Middle West, Northern and Eastern States whose agronomists last winter voted to recommend high analyses mixed fertilizers show that a large proportion of the sales of commercial fertilizer this spring have been of these high analyses, according to officers of the soil improvement committee of the National Fertilizer Association.

In New York, which has an average normal consumption of 400,000 tons of commercial fertilizer annually, it is said that sales outside the five high analyses indorsed by the experiment station officials of that state have been very small. New York selected the smallest list of grades of any of the states which joined the movement to eliminate the low-content mixtures from official recommendations.

Peliminary reports indicate also that sales of fertilizer this spring have been greater in volume than last year and that there has been a substantial increase in the proportion of cash sales. Prices have been lower.

News Notes

Pasteur's memory is being honored in France by a series of meetings commemorating the one hundredth anniversary of his birth. At the first meeting U. S. Ambassador Myron Herrick presided and stated that Pasteur had accomplished more to abolish suffering than any other man in history.

Hampered standardization of weights and measures throughout the country is being caused by the lack of state appropriations for this work. At the sixteenth annual conference held on weights and measures at the Bureau of Standards last week this fact was reported by nearly every state except New Jersey.

Monel metal gauze for flame lamps to be used in gaseous or coal-dust laden atmospheres has been recommended by the Bureau of Mines. Unlike steel, Monel metal does not corrode badly in the atmosphere of damp mines.

Ether production in British Guiana has begun in the plant of an American company. This plant is of particular interest in connection with the development of the new industry for the production of alcohol motor spirit. This industry is enjoying rapidly brightening prospects in countries distant from petroleum production.

Germany's glass industry is in poor condition due mainly to the intense competition of the Belgian and Czecho-slovak industries. The inland demand and exports fell off one-third in April, with the result that many ovens were shut down altogether.

Biological topics featured the meeting of May 24 for the Southern California Section of the A.C.S., which met at Los Angeles. I. Grageroff, H. L. White and M. C. Terry were the speakers.

Tuberculosis treatment based on the use of an alkaline glycerol extract of steapsin or lipase, combined with a small amount of chloroform, is being studied at the Colorado School of Mines. Dr. L. G. Robinovitch, who is conducting the work, reports positive progress on the work so far undertaken,

Important zinc lands in Oklahoma have recently been purchased by the Schwab interests. Since 70 per cent of the country's zinc production, according to Mr. Schwab, is consumed by the steel industry, it is good business policy to have in its own hands a portion of the production of the raw material.

The dye importers' organization, reported some time ago as being under consideration, has not yet taken form, although meetings of parties interested have been held. It is expected that this week's meeting may answer the question of the form of the organization to be adopted.

Hydrocyanic acid may be used successfully in destroying animal pests in their burrows, according to recent Agriculture Department findings. The deadly nature of the gas and the need of caution in handling both it and the ingredients used in its production are emphasized, although it is stated there need be no hesitancy in using this as an anti-rodent if precautions are taken.

Several industrial films prepared by the Bureau of Mines are to be shown at the International Mining Exhibition in London. Copies of the following films have been sent: Story of Coal, Story of Petroleum, Story of Sulphur, Story of Ingot Iron, Story of Rock Drilling, Story of Asbestos, and Story of Alloy Steel.

The sum of $35,000 has been awarded in fellowships and scholarships in the Yale Graduate School for the coming year. Twenty-six fields of study will be represented by this group, the largest numbers being in English, 21; chemistry, and physiological chemistry, 13; history, 11; geology, 10; education, 7; and social and political science, 7.

Carnegie Tech Working on Oil Sludges

The elimination of sludge in turbine engine lubrication is receiving considerable attention at present in the research laboratories of Carnegie Tech. The occurrence of sludge in turbine lubricating oils has in the past greatly cut down the efficiency of these units. Dr. J. H. James is working with Prof. K. K. Stevens in studying the factors involved. Sufficient progress has already been made to allow Dr. James to make the following statement:

"A striking result of our preliminary experiments was that all of the various sludge compounds that we examined showed the presence of fatty acids, proving that the hydrocarbons of the mineral oils had been oxidized. These fatty acids were usually present in the form of metallic soaps. Examination of the sludge leads us to believe that these soaps are really forming greases which comprise the major portion of most of the sludges examined."

Small Stocks of Cottonseed Oil for Remainder of Crop Year

Monthly Consumption Averages 212,000 Bbl.—Seed Receipts at Mills Smaller Than Expected—Visible Supply of Oil Less Than at Corresponding Period Last Year

THE statistical position of cottonseed oil, according to an analysis of the April report of the Bureau of Census covering all cottonseed products, is extremely tight and tends to confirm opinion favoring a rather high level for prices over the remainder of the crop year. The consumption of cottonseed oil during April reached the total of 151,250 bbl., which compares with 110,000 bbl. in April a year ago. The figures were in line with private estimates and indicated that cheap lard did not seriously curtail business. The visible supply was reduced to 720,000 bbl., which compares with 861,000 bbl. on the last day of April a year ago.

Receipts of cottonseed were disappointing, the arrivals at the mills during April amounting to only 21,131 tons. Receipts of seed at the mills from Aug. 1, 1922, to April 30, 1923, amounted to 3,188,881 tons, against 2,871,143 tons for the corresponding period a year ago. The amount actually crushed for the 9 months ended April 30 was estimated at 3,132,666 tons, contrasted with 2,922,230 tons for the corresponding period a year ago.

Stocks of Crude Oil

The Bureau of Census reports production of crude oil for the August-April period at 962,580,720 lb., while for the same period a year ago the production figures were placed at 903,166,622 lb. Production of refined cottonseed oil for the 9 months ended April 30 amounted to 835,584,067 lb., against 790,768,610 lb. for the corresponding period a year ago.

Stocks of cottonseed at the plants on April 30 were estimated officially at 64,752 tons, which compares with 46,140 tons on the same date a year ago. The stocks of crude oil on the last day of April amounted to 37,484,169 lb., against 31,848,336 lb. a year ago.

The stocks of refined cottonseed oil at the plants on April 30 amounted to 236,001,125 lb., which compares with 302,079,057 lb. on the last day of April a year ago.

Consumption of cottonseed oil for the past 9 months shows an increase of 117,000 bbl. contrasted with the 9 months showing for the corresponding period last season. The consumption of oil by months with a comparison, follows:

	1922-23 Bbl.	1921-22 Bbl
August	168,000	260,000
September	234,000	280,000
October	298,000	234,000
November	273,500	174,000
December	190,000	128,000
January	233,000	192,000
February	192,250	208,000
March	167,000	204,000
April	151,250	110,000
Totals	1,907,000	1,790,000

Average monthly consumption of cottonseed oil for the first 9 months of the crop year was 212,000 bbl., against 199,000 bbl. a year ago.

The cotton crop year begins with Aug. 1, but seed does not commence to move in volume before September and it takes another month to convert the seed into available oil. In other words, new crop oil will not come on the market in a large way before October and old crop material will have to fill in the gap between Aug. 1 and the time when the new crop production is actually available. At the close of the 1921-22 season the stocks on hand were estimated at 434,325 bbl., the monthly consumption of cottonseed oil for the last 3 months of the crop year amounting to 155,542 bbl. Later developments in the market proved conclusively that the carry-over was inadequate and a sharp uplift in prices resulted.

Seed Receipts Fall Off

Seed receipts have fallen off in all directions and trade authorities believe that the movement to the mills over the remainder of the season will be smaller than had been expected. Some traders go so far as to predict that not more than 52,000 bbl. of oil will be made from seed that has not yet been accounted for, so that, in addition to the visible of 720,000 as indicated by the government figures as of April 30, a total of 772,000 bbl. will be available for the May-June-July period. Deducting 434,000 bbl. (last season's carry-over) from the 772,000 bbl. now in sight, the supply of cottonseed oil actually available for the next 3 months is reduced to 338,000 lb., or 112,700 bbl. for monthly distribution. Allowing for a larger crush of "invisible" seed, the result of these calculations would not change materially.

Indications now point to a larger cotton acreage for the 1923 season, but it is yet too early for the new crop to exert much of an influence upon the market. Because of the strong statistical position operators believe that new crop developments will not play so prominent a part in the cottonseed oil trade during the early summer months. Of course, it is possible that competing oils and fats will occupy a position of prominence before the new season gets under way and such development should check any sharp upturn in cottonseed oil prices. The speculative element has shown comparatively little interest in the long side of the market, while the existing short interest in old crop options has narrowed down considerably in the last month or so. At current prices for cottonseed oil export business is considered improbable.

Trade Notes

The Pacific Coast Borax Co. has announced a 10 per cent increase in wages for the employees at its plant in Bayonne, N. J.

Société Anonyme pour l'Industrie des Métaux, Lausanne, Switzerland, has taken over the aluminum and metal business of Le Minerai Société Anonyme. The latter company will continue to trade in bauxite and chemical products. C. W. Leavitt & Co., New York, are sole selling agents in the United States for both corporations.

Arthur S. Somers, of the F. L. Lavanburg Co., has been re-elected president of the Brooklyn Chamber of Commerce.

The plant of the New Jersey Chemical & Rubber Works at Hillside, N. J., was damaged by fire last week. Loss is placed between $65,000 and $75,000.

The steamship "President Wilson" arrived at San Francisco last week from Hong Kong and, included in the general cargo, there was 758 tons of china wood oil.

Alfred B. Sloan, president of the General Motors Corporation, has been elected a director of E. I. du Pont de Nemours & Co.

The next convention of the National Foreign Trade Council will be held in Boston, in May, 1924.

California petroleum production in 1922 increased 23,739,332 bbl. over that of the previous year. The gain is attributed to the rapid and intensive development of oil fields in Los Angeles and Orange Counties.

H. Mart Smith, manager of the vegetable oil department of W. R. Grace & Co., will leave today on a business trip through the Middle West.

Charles B. Street, general superintendent of Gutta Percha & Rubber, Ltd., Toronto, Canada, died at his home in that city last Tuesday.

George K. Morrow has been elected president of the American Cotton Oil Co. to succeed L. N. Hine, who will hereafter, as vice-president, devote only a portion of his time to the affairs of the company. Mr. Morrow also was elected a director.

W. M. Gimson, consulting engineer to the Kaurilite Manufacturing Co., of Auckland, New Zealand, is in New York.

Informal discussion on the prospects for trading in linseed oil options by members of the Produce Exchange attracted some attention. The movement, however, did not take on definite form. The proposition was considered some years ago, but was dropped because of lack of interest on the part of crushers. Many in the trade take the stand that an option market in linseed oil would tend to stabilize prices. Option markets in this commodity exist in London and the different Continental crushing centers.

Washington News

Tariff Commission Considers Foreign Organization

The Tariff Commission has under consideration the establishment of a permanent organization in foreign countries. Under the direction of the commission groups of experts have already been sent abroad. It is proposed that a permanent headquarters be established at some central point in Europe. Under the plan discussed experts would continue to be sent to handle special inquiries, but their activities would be co-ordinated through representatives of the commission stationed in Europe permanently.

The plans for a foreign organization, which have been discussed more or less from time to time, have been expanded considerably. It is now proposed that the foreign representatives of the commission shall make reports on industrial conditions and particularly on matters bearing on the tariff. Members of the commission desire to establish a closer contact with conditions in foreign industries regarding which information must be available in determining rates of duty under the flexible provisions of the tariff law.

Fellowships Offered by Bureau of Mines and Colleges

During the next school year, the following universities will offer graduate fellowships in mining, metallurgical and chemical research, in co-operation with the Bureau of Mines: University of Alabama, University of Arizona, Carnegie Institute of Technology, University of Missouri, Ohio State University, University of Utah and University of Washington.

This plan of fellowship first was effected through a co-operative agreement between the Bureau of Mines and the University of Utah in 1914. The results have been highly successful throughout that period. The fellowships are awarded graduates of colleges, preferably of mining schools, who have shown special aptitude for research and investigational work.

Appraisers Sustain Protest on Creolin Pearson Duty

The Board of United States General Appraisers, in an opinion sustaining protests of Merck & Co., finds that creolin pearson, containing pyridine and naphthalene, but not manufactured therofrom, was properly dutiable at 15 per cent ad valorem, either as a non-enumerated article or as a chemical compound, under paragraph 385 of the tariff act of 1913, rather than under group 3, Title V, section 500, of the act of Sept. 8, 1916, at 30 per cent ad valorem, as a coal-tar product suitable for medicinal purposes.

Refractories Standardization Looms in Steel Industries

In response to the request of prominent manufacturers and users of sleeves, nozzles and stoppers required in steel making, the division of simplified practice of the Department of Commerce called a meeting of all interests concerned on May 21. The American Foundrymen's Association had adopted six nozzles, nine sleeves and one stopper as standard at its convention on Oct 17, 1918, but these standard types and sizes have not been widely recognized throughout the steel industry, as is shown by the fact that there are now close to 300 types and sizes of these refractories on the market. This great variety complicates production, hinders efficient distribution and retards service until now both the producers and the consumers favor applying simplified practice or the elimination of the superfluous and excessive varieties and the retention of those types and sizes in proved greatest demand.

It was agreed at the conference that standardization would be advantageous to all parties and for that reason it was recommended that the Department of Commerce call a general conference of makers and users. June 18, 1923, was the day set to hold this conference in Washington.

Manufacturers of Picric Acid Subject to Tax

For the information of internal revenue officers and others concerned, C. R. Nash, acting Commissioner of Internal Revenue, has issued a statement to the effect that a person who manufactures and sells for military purposes picric acid containing 10 per cent water is a manufacturer of an explosive within the meaning of section 301, subdivision 1 (*a*) of the revenue act of 1916 and hence subject to the munition manufacturer's tax levied under Title III of that act.

This is issued, not as a ruling of the Treasury Department, but is in accord with a decision handed down in the United States District Court for the Southern District of New York.

Returns on New York Coal-Tar Imports Merely Approximate

The returns being made to the Department of Commerce on importations of coal-tar products at the port of New York are being compiled with the idea that the record is only approximate. The idea is to make available promptly a general idea of the volume of these imports. These returns have no value as a statistical record, it is pointed out, as the accurate figures showing imports at all ports become available a month or 6 weeks later.

Industrial Gas Section to Organize

Engineers interested in the industrial sales of city gas are planning to organize a section of the American Gas Association to deal particularly with this phase of the industry. The organization meeting will be held June 6 at the Engineering Societies Building, New York City.

During recent years the commercial branch of the gas industry has been actively represented by the Commercial Section of A.G.A. However, most of the attention of this section has necessarily been given to lighting, cooking, water heating and other domestic applications of gas and the problems of salesmanship in these fields. The engineering sales work involving design, installation and maintenance of industrial equipment for large-scale use of gas has not been as much considered, and engineers interested in those fields have been instrumental in getting authority for this new section.

Financial Notes

The Texas Gulf Sulphur Co. has declared a quarterly dividend of $1.50 a share. The company previously had been paying dividends at the rate of $5 a share per year.

Stockholders of the Lee Tire & Rubber Corporation will meet June 6 to vote on proposed increase in capital stock from 150,000 shares to 300,000 shares, no par value. It is reported that the new issue of stock will be used to purchase the Republic Rubber Co. of Youngstown, Ohio.

The United Drug Co. has declared a dividend of $1.50 on the common stock. Dividends had been passed since September, 1921, prior to which time the stock had been on an 8 per cent basis.

The Arnold Print Works has increased capital stock from $1,500,000 to $3,000,000 by addition of 15,000 shares of $100 par common to be issued as a 100 per cent stock dividend to holders of record May. 2.

The Chemical Paper Manufacturing Co. has increased its capital stock from $2,000,000 to $2,500,000.

The Pure Oil Co. is negotiating with bankers for new financing to the extent of between $8,000,000 and $10,000,000. It is understood that the financing is for the benefit of the company's subsidiary, the Humphreys Oil Co.

The Casein Co. of America has issued its annual report, which shows a surplus, after depreciation, of $407,159 for the year ended Dec. 31. This compares with a deficit of $82,175 for the year preceding.

Voting trust certificates for 402,131 shares of capital stock of the Columbian Carbon Co. have been admitted to trading on the New York Stock Exchange.

Ultramarine Plant Started

The National Ultramarine Co., organized by a group of West Virginia business men, will erect a $200,000 plant at Cincinnati, Ohio. It is announced that this company is to promote the invention of Ralph Baugher of Huntington, W. Va., in the manufacture of its product. The details of this method have not been disclosed.

Ultramarine blue is considerably used as a pigment in inks, in wallpaper whitening and in bringing food products such as sugar and flour to color.

Exposition Plans Course in Chemical Engineering

Exhibits as Planned Indicate an Extremely Interesting Show in September

Students of chemistry and chemical engineering who attend the Ninth National Exposition of Chemical Industries are to have an unusual opportunity to study the exhibits. Group conferences and a series of lectures have been planned. This short practical course to be given in connection with the 1923 exposition will be under the guidance of a number of the industry's biggest men, and will be without cost to the students. It will include plant equipment in disintegrating, mechanical separation and grading, thickening, filtration, and separation by centrifugals, evaporation, distillation, drying and the general handling of materials. The "why, when and where" of construction materials will also be given attention. Chemical distribution in commerce will be the third phase. Students desiring to attend and instructors wishing to enroll classes are required to file applications with the exposition management at the Grand Central Palace, New York, before the closing of colleges this year. Accommodations for students during their stay in New York will be arranged at Columbia University dormitories.

Preliminary Exhibition Plans

An endeavor is being made to have the exposition more complete this year than ever before. A consolidated dyestuff exhibit of a very elaborate nature, furnished by a number of the leading American manufacturers, has been planned. Dye for everything from the rug on the floor to the paper on the ceiling, including the apparel of the occupants, will be shown in a new way. The actual production of furfural from corncobs, a completely equipped modern chemical laboratory alongside of an ancient alchemist's shop, chemical warfare in operation, and other novel exhibits have been listed among the preliminary plans. The educational exhibits of the exposition, already taking shape under the direction of Major H. S. Kimberly, who was recently selected by the advisory committee for this work, will cover a broad field and aim to show the human relation, breadth and importance of the chemical industry, particularly its developments since the war, to the American business man and the public. To sell the idea of America's self-sufficiency in chemicals, dyes, chemical machinery and equipment, and complete independence from Europe, is being made the basis for the entire educational scope of the Ninth Chemical Exposition when it is held during the week of Sept. 17 to 22 at Grand Central Palace, New York.

Treasury Department Issues Instructions on Currency Conversion

Determines Necessity for Consular Invoices—Collectors Also Instructed to Make Allowance for Shortages in Delivery

THE Treasury Department has issued instructions to customs collectors regarding the conversion of currency for the purpose of determining the necessity for consular invoices in making export shipments from foreign markets. The opinion as expressed by the Assistant Secretary of the Treasury is that if the proclaimed value of foreign currency in which the foreign value or the export value of the merchandise is expressed varies by less than 5 per cent from a value measured by the buying rate in the New York market at noon on the day of exportation, conversion must be made at the proclaimed value. This, it was stated, follows the provisions of section 522 of the Fordney-McCumber tariff act and if the result of such conversion exceed $100, a consular invoice is necessary. Under section 482 of the tariff act consular invoices are required for goods exceeding $100 in value.

If, however, the decision continues, the value of the foreign currency has not been proclaimed, or if the proclaimed value varies by 5 per cent or more from a value measured by the buying rate in the New York market at noon on the day of exportation, conversion shall be made at the rate certified by the Federal Reserve Bank of New York, also following the provisions of section 522, and if the result of such conversion exceeds $100, a consular invoice is necessary.

Another important decision was rendered by the Treasury Department. It had reference to an allowance in assessing duties, in cases where the delivery of goods to the consignee showed that a shortage existed, as compared with the quantity shown on the shipping documents. The decision was made as a result of a finding on the part of the Court of Customs Appeals and directs collectors to follow the rule laid down in the courts' decision that the collector shall make allowance in the absence of fraud for any deficiency reported to him by the appraiser when the merchandise has at all times been in the uninterrupted possession of the government, notwithstanding that the deficiency is due to robbery occurring after importation. The decision was handed down in the case of McKesson & Robbins and held that section 2991 of the Revised Statutes is unambiguous and mandatory in the requirement that the collector shall make the allowance mentioned for shortages.

The rule affects enforcement of the concluding provision of section 499 of the Fordney-McCumber tariff act and the first paragraph of article 608 of the Customs Regulations is amended to read as follows:

"Allowance shall be made in the liquidation of duties for deficiencies in packages found by the appraiser or other customs officer and so certified to the collector."

The second paragraph of article 608, as amended by T. D. 37813 has in consequence been amended by striking out the word "two" and substituting the word "five," thus extending the time within which applications may be filed for allowance in duties on account of shortage in an unexamined case.

Investigate Foreign Control of Crude Rubber

Plans for investigating the crude rubber situation, especially with reference to the monopoly of the industry as now held by foreign countries, have now been well advanced. The Commerce Department will undertake this investigation and will utilize a special staff of rubber experts. The latter will visit primary sources of supply and will make a study of the best methods of production with a view to developing possible American controlled sources of supply.

Lehigh Tests to Develop Metal Strain Measure

Stretching a metal until it squeaks and listening for the squeak with a microphone will give a test showing how much strain that metal can stand as a girder or as a rail, according to experiments conducted in the physics department of Lehigh University.

These experiments may develop a novel method for finding quickly and accurately the elastic limit of metals. By this method all forgings may be rapidly tested before they are put into use. Several kinds of metals have been successfully tested in the Lehigh laboratory.

It was found that squeaking, rasping sounds were produced after the pull had reached a certain definite value, and this value was different for the different metals used. The tests indicated that the sounds, caused by grating of the molecules, were not produced until the elastic limit of the material had been reached. The work is likely to be continued with more refined apparatus in the Lehigh physics laboratory.

Facts and Figures That Influence Trade in Chemical Products

Market Conditions

Current Prices
Imports and Exports
The Trend of Business

Large Holdings of Imported Chemicals Weaken Prices in Spot Market

Absence of Shipment Orders Also Depresses Foreign Markets—Prussiate of Soda Lower—Imported Caustic Soda Easy—Tin Oxide Marked Down—Resale Offerings of Nitrate of Soda—Bichromates Hold Strong Position—Arsenic and Calcium Arsenate Quiet

IT IS reported that large stocks of imported chemicals are held in warehouses in the local market and that prices are gradually softening as a result of the heavy unsold stocks. In some cases arrivals have been offered at attractive prices on an ex-dock basis, in order to avoid handling and storing charges. The fact that importers have been less active in placing orders for forward positions also has had a weakening effect on foreign markets and in many instances has been followed by lower prices for shipment. Consuming demand among domestic trades also has fallen off to a marked degree and this combination of circumstances works against any real stabilization of prices.

The effect of competition from materials of foreign origin has some influence on domestic chemicals and the weighted price index for the week indicates a slightly lower price level. Bichromates are included among the materials which are independent of foreign competition and both the soda and potash compounds are very firm in price with logical reasons for the present selling prices. Unseasonable weather has been responsible for diminished consumption of some chemicals, notably tartaric and citric acids, and values for the latter have been correspondingly affected. Tin oxide was marked down 2c. per lb. during the week with a lower market for the metal as the chief contributing cause of the decline. Other metal salts were unchanged in price.

Arsenic and calcium arsenate are followed with close attention but this has not been reflected in the buying movement as holders of both these commodities report a slow trading movement. Uncertainty about the trend of prices as well as doubt about future supplies accounts for the reluctance of buyers to take on commitments at current levels. It is generally held that large supplies of calcium arsenate will be required within the next 2 months but confidence in higher prices for either arsenic or arsenate has been shaken.

Export inquiry for caustic soda has not been pronounced and export trading throughout the chemical list has fallen below the levels noted earlier in the year.

Scarcity of labor is becoming more of a factor with domestic producers of chemicals. This is accounted for by the fact that more desirable positions have been open for unskilled labor and many have deserted the chemical industry and restricted immigration makes it difficult to fill all positions.

Acids

Acetic Acid—Outside of the maintenance of the recently advanced price list, there is no feature to this market. Demand is reported to be routine with export demand a very unimportant factor. Prices are repeated at 3.38c. per lb. for 28 per cent and 6.75c. per lb. for 56 per cent. Glacial continues to show a range in price according to seller with 12c. to 12.78c. per lb. representing sellers' views.

Butyric Acid — Producers have no difficulty in disposing of their output and the even balance between supply and demand has a steadying effect on values. Current asking prices are 85c. @90c. for 60 per cent and $1.30@$1.35 per lb. for absolute.

Citric Acid—Unseasonable weather is given as a reason for the moderate buying movement shown in the present market. The price of domestic makers remains at 49c. per lb. and a good movement from works is reported, largely against old orders. Competition from foreign citric is not keen and reports from primary centers abroad indicate firm conditions. Imported grades on spot are held at 52c. per lb. and shipments appear to be firm at 51½c. per lb.

Formic Acid—Some improvement is reported by local sellers with imported offerings receiving most attention. Stocks of the latter are plentiful and an easy tone has developed with prices at 14½c. per lb.

Oxalic Acid—There were free offerings of imported oxalic acid at 13¼c. per lb., but total volume of sales was said to be small and the market presents a very quiet appearance. No change in domestic prices was reported and 13½c. per lb. works is the best price quoted.

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	**177.58**
Last week	177.66
May, 1918	270.00
May, 1919	248.00
May, 1920 (high)	280.00
May, 1921 (low)	143.00
May, 1922	159.00

The easier undertone continued and the week's index number reflected less favorable trading conditions in the drop of 8 points. C. P. glycerine sold down to 17c. in refining circles.

Sulphuric Acid—Buying interest is not especially heavy but the sold up condition of many producers and the limited offerings in most selling quarters give prominence to the buying side of the market. Prices are very firm with 60 deg. acid quoted at $9.50 per ton and upwards, in tanks at works. For 66 deg. acid sellers ask $16@$17 per ton in tanks. Oleum is in very limited supply and the price trend has been upward. Current quotations are $19@$20 per ton.

Tartaric Acid—Consumers have not taken hold in an active way and values have eased off. Holders of imported have been more eager to move stocks and have quoted 36½c. per lb. The backward season has been responsible for the lessened consumption and this has offset reports of reduced outputs in foreign countries. Domestic makers continue to quote 37½c. per lb.

Potash

Bichromate of Potash—Official figures show that exports of this chemical in March were 1,033,857 lb., which compares with 648,086 lb. in March, 1922. This bears out reports that export buying so far this year has been better than last year. Strength of prices is the feature in the present market. One producer is reported to be unable to take on new business for prompt delivery and others report lessened production. Prices are held at an inside figure of 11½c. per lb. with 12c. per lb. asked for small lots.

Caustic Potash — There are some brands of imported caustic which are well maintained in price with 7¾c. per lb. asked. Other offerings, however, are free and the market appears weaker than ever with 7½c. per lb. for spot material and shipments have been offered at 7⅝c. per lb. Demand is slow and stocks on hand promise to prevent any nearby recoveries in price.

Carbonate of Potash—Large offerings have had an influence on market values and sales of 80-85 per cent calcined have been reported at 6½c. per lb.

Hydrated 80-85 per cent was quiet with the general asking price at 7¾c. per lb. but on firm business it was stated that 7½c. per lb. could be done.

Chlorate of Potash—Heavy arrivals of German chlorate reached the market during the week. Sellers reported prices unchanged but there was an easier undertone and buyers did not appear to have much confidence in the quoted values. The quotation is 7½c. per lb. Domestic makes are held at 8½c. per lb., works.

Permanganate of Potash—The spot market is openly quoted at 18½c. per lb. with only moderate interest shown by buyers. The shipment market has been unsettled by the withdrawal of bids by importers and prices c.i.f. New York have been reduced in order to induce buying. Many sellers stated that there was no fixed price for nearby shipments but it was intimated that holders abroad would consider bids around 17c. per lb.

Prussiate of Potash—Resale lots of yellow prussiate have been offered regularly and have had a disturbing effect on prices. Sales are said to have gone through at 36c. per lb. with 36½c. per lb. asked in different quarters. On shipments as low as 35c. per lb. has been heard. Red prussiate is inactive and it is a buyers' market with values variously reported from 65c. to 70c. per lb.

Sodas

Soda Ash—There is an irregular demand for moderate sized quantities on new accounts but the greater part of the activity of the market is concerned with deliveries against contracts. Price changes are infrequent and prominent factors continue to quote light ash at 1.20c. per lb. in single bags, carlots, at works. Light ash in barrels is held at 1.40c. per lb., works. Dense ash is offered at 1.25c. per lb. in bags at works, basis 48 per cent. In the spot market light ash is quoted at 1.75c. per lb. in single bags and 1.95 per lb. in barrels.

Bichromate of Soda—The firm position of bichromate has continued through the week. Some large producers are reported to have sold large amounts prior to recent advances in price. With producing costs rising they did not care to take on further orders for large lots at the lower price level. Consequently they marked up prices and other producers followed suit. For the time being, at least, competition among sellers is not not keen and reports that current values are based on producing costs, are generally credited. Asking prices are 8½c. per lb., works, and upward on a quantity basis.

Caustic Soda—No improvement in export demand has been shown and though most sellers are quoting at unchanged price levels, the market can hardly be described as firm. In some quarters there is a disposition to hold the f.a.s. quotation for standard brands at 3.40c. per lb. but this figure is too high to interest buyers and 3.35c. per lb. is more representative of the market with the possibility of doing 3.30c. per lb. on outside brands. There is a steady withdrawal on contracts to domestic consumers with 2½c. per lb., carlots, works, quoted for basis 60 per cent. The spot market is steady at 3½c. per lb., flat for round lots.

Nitrate of Soda—Arrivals from primary points have brought out some selling pressure and reports were heard that spot material sold at $2.52½ per 100 lb. Stocks at southern points also are reported to be large and some resale material is reported to have changed hands as low as $2.40 per 100 lb. For June delivery local sellers were asking $2.57½ per 100 lb. For July forward the schedule as recently adopted was in effect with prices ranging from $2.45 to $2.60 per 100 lb. according to time of delivery. A report from Europe states that German synthetic nitrate is in supply barely sufficient for requirements in that country. The report further states that stocks of nitrate of soda in the United Kingdom held on speculative account have been liquidated and prices have firmed up. Production in Chile has not been curtailed to any extent as yet but exports for April exceeded production.

Prussiate of Soda—Slow demand and free offerings have added to the weakness of prices and buyers have been able to take on stocks at greater advantage during the past week. Spot material has been offered at 16½c. per lb. without arousing any sustained interest from buyers. For June delivery there were sellers at 16c. per lb. and this included some prominent domestic producers.

Miscellaneous Chemicals

Arsenic — Very little change was noted in market during the week. Buyers are watching closely but are buying only when prices are made attractive. Arrivals from foreign markets are coming in regularly. Moreover stocks are held by numerous sellers and this makes consumers cautious about placing orders. The spot market was dull at 14¾@15c. per lb. It is possible that the inside figures could be shaded but for the most part holders are not pressing matters. Domestic producers are quoting 13½c. per lb. for prompt and 12c. per lb. for June-July. For the second half of the year they quote 11c. per lb.

Alum—Domestic makers of ammonia alum are holding prices on a steady basis with buying described as moderate. Lump is held at 3.50@3.60c. per lb. Chrome alum has responded to higher producing costs and the inside figure is now placed at 5¾c. per lb. Imported potash alum was quiet and easy in tone with quotations at 3@3½c. per lb. for lump.

Calcium Arsenate—Demand is proving disappointing. Dealers and distributors placed orders some time ago but in many cases they have not yet taken April deliveries. Stocks are fairly large and it is a question whether selling pressure or buying demand will first assert itself. Prices are generally quoted at 17c. per lb. but some sellers admit they are open to bids and at present it is a buyers' market with 16c. per lb. as a figure at which business might be done.

Copper Sulphate — Leading makers continue to quote the market at 6c. per lb. on the large crystals and 5.90c. per lb. on the small. It was reported that smaller operators in domestic goods took on business down to 5.75c. per lb. Imported material was easier and prices heard during the week ranged from 5⅛@5⅝c. per lb. immediate delivery. Stocks of foreign material were considered large. A ording to some reports Canadian buyers took on several lots of imported sulphate. The shipment quotation on German goods settled around 5⅝c. per lb.

Epsom Salt—Several large parcels arrived from German ports, but, according to dealers, nearly all of this material will go into firm hands. The market settled at 90c.@$1.00 per 100 pounds.

Nickel Salts—There were transactions in less than carload lots on the former basis of 10½c. on the double and 11½c. on the single, in barrels.

Tin Oxide—The market eased off on the recent decline in the metal. The quotation was cut 2c. per lb., establishing the market on the 48c. per lb. basis. Demand was quiet all week. A slightly higher market for the metal set in just before the close and this seemed to steady prices for the oxide.

Sal Ammoniac—Pressure to sell imported material was in evidence and lower prices were named in more than one direction. The white granular, imported, in casks, closed nominally at 6½@6¾c. per lb., immediate delivery. Domestic held at 7½@7¾c. per lb. On the gray domestic the offerings were moderate and prices held at 8@8¼c. per lb., f.o.b. point of production.

Sulphate of Ammonia—Contract business has made its appearance in fair volume and considerable business has been booked in the past two weeks. The prices quoted are on a basis of $3 for delivery at northern points and $3.15 for delivery in the south. The spot price is given at $3.25 per 100 lb. for bulk lots and f.a.s. quotations are $3.60 @$3.65 per 100 lb.

Alcohol

No additional price changes were reported by first-hands. The advance in denatured was maintained, although scattered parcels of imported material might have been picked up at concessions. The special, No. 1 formula, closed at 35c. per gal., in drums, and 41c. per gal. in bbl., carload basis. Completely denatured, formula No. 1, 188 proof, was offered by leading interests at 43c. per gal., in drums, and 49c. per gal., in bbl. Demand for denatured was quiet. Ethyl spirits, 190 proof, U. S. P., closed unchanged at $4.70 per gal. Methanol also was unaltered in price, producers asking $1.18 per gal. on the 95 per cent grade.

Coal-Tar Products

Naphthalene Imports Increase; Prices on Spot Easier—Cresylic Acid Lower—Phenol Unsettled—Salicylates Irregular

THE market for naphthalene was easier in nearly all directions. Trading was inactive and with foreign offerings lower some shading of spot prices was apparent. The importations of crude material again assumed large proportions, the bulk of the naphthalene arriving coming from Rotterdam. Intermediate makers appear to be stocked up for the time being and no new business of consequence went through.

One of the largest producers of salicylic acid reduced prices to the extent of 5c. per lb., due, no doubt, to the keen competition in the salicylates. This reduction narrowed the range of prices so that leading factors were only 5c. apart instead of 10c. Demand for the salicylates showed no improvement. Phenol on spot in outside channels was unsettled, but no radical change in prices occurred. A feature was the decline in cresylic acid, spot prices on the imported closing about 5c. per gal. lower. Domestic makers reported the market on cresylic as nominally unchanged.

Benzol demand was described as fair in some quarters, while other operators said that they could not interest buyers. The offerings of zylene on spot were scanty and firm prices prevailed in all quarters.

Aniline Oil—Producers reported a steady market notwithstanding the routine nature of business. Prices held at 16c. per lb. in drums, carlots, immediate and nearby delivery.

Aniline Salt—There were offerings of aniline salt at 23c. per lb., immediate shipment. The market was barely steady in some quarters.

Benzaldehyde—There was a fair inquiry for benzaldehyde, and leading producers continued to quote firm at 75@80c. per lb. on the technical grade, drums included.

Benzylchloride—Production is limited and spot prices were wholly nominal. On nearby material there were offerings at 30c. on the technical grade and 45c. on the 95@97 per cent refined.

Beta Naphthol—There were offerings of the technical grade on spot at 22c. per lb., indicating that first hands were no longer so firm in their ideas.

Benzene—The demand was restricted to the motor grades, according to first hands, and production of pure benzene was limited to actual requirements only. As a result of this policy prices for the pure were maintained on the 30c. basis in spite of the positive nature of business. The 90 per cent grade held nominally at 27c. per gal. tank-car basis.

Cresylic Acid—Offerings of spot material of foreign make were freer and prices again softened. There were sellers of the 97 per cent grade at $1.20 per gal. On the 95 per cent, dark, a price of $1.10 per gal. was named here. Domestic producers say that their output is sold ahead and refused to name a flat quotation.

Naphthalene — Importations were large, and with cables on crude easier, prices at the close were unsettled. Crude to import settled at 3¼@3⅜c. per lb. Flake on spot sold at 8⅞c., a decline of ⅛c. from the trading level of the week previous. On ball the market held around 9¼@9⅜c. per lb.

Phenol—One small parcel sold on spot at 49c. per lb., but additional offerings at this figure did not come out. In a general way the asking prices at the close ranged from 52@54c. per lb. for spot goods, which compares with 54@55c. per lb. a week ago. Demand was inactive and the undertone on resale material was barely steady. Producers report a sold up condition so far as they are concerned. Deliveries against contract are moving at 27@28c. per lb.

Salicylic Acid—One factor, who previously held out for 50c. on the U.S.P. grade, lowered his views to 45c. during the past week. In several other quarters the U.S.P. grade was offered at 40c. per lb. The demand was quiet, the recent exhibition of price cutting being too fresh in the minds of prospective buyers.

Paranitraniline—Producers held out for 75c. per lb., but in some quarters it was possible to pick up supplies at concessions. Second hands reported scattered business at 70@72c. per lb.

Solvent Naphtha—Demand was not so active and there were offerings on the basis of 27c. per gal. in tanks for the waterwhite immediate shipment from works.

Belgian Hand-Made Window Glass Production Declines

A report from Vice-Consul Schuler at Brussels states the manufacture of window glass in Belgium is undergoing a change, with the factories discarding the hand-making process for machines.

Factories now operating with Fourcault glass-making machines are operating at Dampremy and Montignies, while several plants at Roux are putting in glass-making machines. A new window glass-making plant which is also to use Fourcault machines is to be established at Zeebrugge. Glass manufacturers at Dampremy are interested in this proposed factory.

Another mechanical glass-making plant, that of Libbey Owens, in which American and Belgian capital is interested, has begun operation. This factory, work on which was started in 1921, is nearly finished. It will have a daily production of 40,000 sq.m. of glass.

Annual Coal-Tar Census to Be Issued in June

All data for the annual census of coal-tar dyes and chemicals and synthetic organic chemicals from other than a coal-tar base have been received by the Tariff Commission. The work of compilation will be started immediately under the direction of W. N. Watson, color specialist and acting chief of the chemical section, and it is hoped to issue the report some time before the end of June.

The census will present statistics on domestic production and on importations during 1922, arranged so the figures may be interpreted readily.

George Rossen to Head Produce Exchange

The annual election of officers to the New York Produce Exchange will be held on June 4. George Rossen has been nominated for president, P. H. Holt, vice-president and Edward R. Carhart, treasurer. W. A. Johns, L. W. Forbell, B. H. Wunder, W. W. Starr, Winchester Noyes and William Beatty are on the regular ticket as managers to serve for a period of 2 years.

Latest Quotations on Industrial Stocks

	Last Week	This Week
Air Reduction	64⅜	61¼
Allied Chem. & Dye	67	68½
Allied Chem. & Dye, pfd.	110	110
Am. Ag. Chem.	18	17½
Am. Ag. Chem., pfd.	43	40
American Cotton Oil	9¼	9⅝
American Cotton Oil, pfd.	19⅝	19
Am. Drug Synd.	5¼	5½
Am. Linseed Co.	27½	23
Am. Linseed Co., pfd.	46¼	43
Am. Smelting & Refining	56	55⅝
Am. Smelting & Refining, pfd.	96½	96½
Archer-Daniels Mid. Co., w.i.	38½	37¼
Atlas Powder	172	170
Atlas Powder, pfd.	90	90
Casein Co. of Am.	*60	*60
Certain-Teed Products	38½	*40
Commercial Solvents A	28	29½
Corn Products	131	126⅝
Corn Products, pfd.	116¼	118
Davison Chem.	27	23½
Du Pont de Nemours	131	123¾
Du Pont de Nemours, db.	86	86
Freeport-Texas Sulphur	15	13½
Glidden Co.	9	8½
Grasselli Chem.	130	*130
Grasselli Chem., pfd.	*103	*103
Hercules Powder	105	105
Hercules Powder, pfd.	103	105
Heyden Chem.	1⅞	2
Int'l Ag. Chem. Co.	3	5¾
Int'l Ag. Chem. Co., pfd.	25	16¼
Int'l Nickel	14½	13⅞
Int'l Nickel, pfd.	78	79
Int'l Salt	*90	*90
Mathieson Alkali	43	44⅜
Merck & Co.	85	86¾
National Lead	118⅞	113¾
National Lead, pfd.	112½	112
New Jersey Zinc	163	162
Parke, Davis & Co.	81	81
Pennsylvania Salt	89	88
Procter & Gamble	*140	*140
Sherwin-Williams	*29½	28¾
Sherwin-Williams, pfd.	*101	*101
Tenn. Copper & Chem.	10¼	9⅞
Texas Gulf Sulphur	60⅞	60¾
Union Carbide	61	56⅝
United Drug	80	80
U. S. Inl. Alcohol	56½	51⅝
Va.-Car. Chem. Co.	11½	10
Va.-Car. Chem. Co., pfd.	37	30

*Nominal. Other quotations based on last sale.

Vegetable Oils and Fats

Cottonseed Steady on Light Offerings—Linseed Dull and Irregular in Forward Positions—Tallow Firmer

TRADING in vegetable oils was inactive, yet prices did not change much one way or the other. Cottonseed, both crude and refined, reflected the tight statistical situation and a feature during the week was the strength in the May option. New crop developments failed to exert much of an influence on the market. Arrivals of Argentine flaxseed were heavy, and with new business in oil disappointing it appears more than likely that the shortage in the supply available for immediate shipment will soon be a thing of the past. Coconut was unsettled on reports of lower prices on the coast. China wood was dull and prices named were wholly nominal. Soya bean oil was unchanged. Crude corn sold off in the west. Palm oils were easy early in the week on the drop in tallow, but steadied later. Tallow sold as low as 7¼c. ex-plant on the recent slump.

Linseed — Several crushers entertained firmer views on early June business, but in the absence of any imported trading, and with foreign oil available at concessions, the market favored buyers throughout the week. Spot and first half of June delivery closed at $1.13@$1.14 per gal., in cooperage, carload lots. On late June business prices ranged from $1.11@$1.12 per gal., while July forward held at $1.03@$1.04 per gal., carload lots, cooperage basis. The demand for futures was dull and crushers admitted that no real effort has been made for some time past to really sound the market on distant deliveries. Imported linseed oil was offered for immediate delivery at $1.05@$1.07 per gal., in bbl., duty paid. Duluth seed was easier at one time, but reports of frost in the flax belt steadied prices before the close. The planting season for all grains is late and this may result in a larger acreage to flax than was first predicted. With planting still under way it is too soon for any estimates on the acreage. Argentine offerings increased and the June option at Buenos Aires went down to $1.91½. Exports from the Argentine to all countries since the first of the year amounted to more than 31,000,000 bushels. Indian shipments for the past week amounted to 400,000 bushels consigned to the United Kingdom and 32,000 bushels consigned to the Continent. Export demand for cake in the New York market was quiet with prices nominal at $34@$35 per ton.

Cottonseed—In the option market for refined oil the feature was the strength in the May position. Shorts were buyers in a narrow market and with lard firmer prices showed moderate gains. Cash business was fair for this season of the year and generally operators felt that business will continue at a pace sufficient to exhaust the old crop offerings, especially if prices do not advance out of all proportion to the intrinsic value of the commodity. The statistical situation, reviewed elsewhere in this issue, is said to be the strongest in years. Crude oil offerings in the south were light and holders refused to quote less than 10c. per lb., buyers' tanks, f.o.b. mills, southeast and valley. In Texas scattered lots sold at 9¾c., f.o.b. mills. Bleachable oil was advanced ¼c., the market closing at 10½c. per lb., buyers' tanks, f.o.b. Texas common points. Consumption of oil during April amounted to 151,233 barrels, which compares with 167,000 bbl. in March and 110,000 bbl. in April a year ago. The April showing was better than expected, especially in view of the lower market for lard. Lard compound held at 12¾@13¼c. per lb.

China Wood Oil—Demand was lacking and prices were unsettled in all directions. Several round-lots arrived here last week, but most of this oil had been sold on contract. Spot oil settled at 28c. asked, with nearby at 25c. and futures at 23c. On Oct.-Nov.-Dec. business 21c. could have been done.

Coconut Oil—Offerings were liberal and prices again were unsettled. It was reported that a large soaper took on a long time contract at 8½c. for Ceylon type oil, sellers' tanks, delivered. Spot and nearby Ceylon type oil closed at 8⅝c. asked, sellers' tanks, New York. On the Pacific coast nominal prices ranged from 8@8⅛c., sellers' tanks, May-June-July shipment. Manila oil in bulk settled at 7¾@7⅞c., c.i.f. coast ports.

Corn Oil—Several cars of crude oil sold at 9¼c., f.o.b. point of production, a decline of ¼c. for the week.

Olive Oil Foots—Prime green foots were offered at 9@9¼c. per lb., spot New York, while on ex-dock material it was intimated that 9c. could have been shaded. The market was quiet.

Palm Oil—Lagos ex-dock was offered at 7¼c. at one time. No important business resulted. Niger settled at 7@7¼c., as to position and seller. Towards the close prices steadied a little on the recovery in tallow.

Menhaden Oil—The fishing will commence this week. Reports from several of the fish factories indicate that operators are experiencing difficulty in securing labor at reasonable wages and it is probable that the entire fleet may not be able to participate. This kind of talk tends to support oil prices in the face of quiet trading conditions. Crude menhaden oil was held at 50c., tank cars, works, forward delivery.

Tallow and Greases—The lowest trading basis for extra tallow was reached about a week ago when one lot sold at 7¼c. per lb., ex-plant. Later some export buying set in and this steadied the market. Late last week 7½c. ex-plant was pad for a round-lot, Oleo stearine sold down to 9c. per lb., 5 cars changing hands at this price. No. 1 oleo oil sold at 13¾c. Yellow grease closed at 6¾@7c. per lb.

Miscellaneous Materials

Casein—Importations were heavy and this was reflected in irregular prices for spot material. At the close the lower grades were available at 19½@22½c. per lb.

Glycerine—There were offerings of C. P. glycerine by producers not so well established in this market at concessions which seemed to unsettle prices. Leading refiners offered C. P. at 17c. in drums, which compares with 17½c. a week ago. During the week outside goods sold down to 16½c. Dynamite was wholly nominal in the absence of demand of consequence and scattered lots might have been picked up for less than 16c. per lb., carload basis. The crude held relatively steady and 11c. appeared to be the inside trading level on domestic soap-lye, 80 per cent, loose, carload lots, but no sales were reported. Arrivals of foreign crude attracted some attention and, according to reports, refiners have been steady buyers of imported goods.

Naval Stores—The market for turpentine eased off again in sympathy with lower selling ideas in the south. There were offerings here at $1.11@$1.15 per gal. and prices at the close were very unsettled. Advices from the south revealed larger receipts, with only scattered buying. Export trade was slow in all directions. Rosins also developed weakness and final prices were from 5@10c. per bbl. lower. The "B" grade settled at $5.85@$5.90 per bbl.

Shellac — Cables from Calcutta reported an unsettled market and operators here appeared anxious to liquidate. T. N. on spot sold at 60@62c. per lb., which compares with 62@63c. per lb. a week ago. Bleached, bonedry, was lowered to 73c. on spot. Superfine orange settled at 66c., with the ordinary at 63@64c. per lb.

Varnish Gums—Batavian damar was in larger supply and quotations were revised downwards to 28@28½c. On futures prices ranged from 27½@27¾c. per lb. Demand was quiet.

White Lead—There was a steadier market for the metal, but leading interests continued to offer pig lead at 7¼c., New York. Standard dry white lead was in good demand and corroders maintained prices on the basis of 9¾c. per lb., in casks, carload lots. Other lead products also closed the week unchanged. The undertone, however, was barely steady.

Zinc Oxide—New business was not so much in evidence, but deliveries against old contracts were sufficient to take care of production and everything considered the market presented a steady appearance. Leading producers held out for 8c. on the American process, lead free. Red seal, French process, was unchanged at 9¾c. per lb.

Imports at the Port of New York

May 18 to May 24

ACIDS—8 cs. lactic, Hamburg, C. B. Richard & Co.; 100 csk. tartaric, Palermo, Order; 150 csk. citric, Palermo, Order; 700 bbl. tartaric, Bari, Order; 22 dr. cresylic, Liverpool, W. E. Jordan & Bro.; 160 dr. cresylic, Liverpool, Order; 28 dr. cresylic, Glasgow, Guaranty Trust Co.; 5 dr. cresylic, Glasgow, Order; 12 dr. cresylic, London, M. De Mattia Chem. Co.; 75 dr. cresylic, London, Order; 100 bbl. stearic, Rotterdam, M. & W. Parson; 65 csk. oxalic, Copenhagen, Roessler & Hasslacher Chem. Co.; 57 dr. cresylic, Rotterdam, Lunham & Moore.

AMMONIUM—42 csk. muriate, Glasgow, Guaranty Trust Co.; 20 pkg. carbonate, Liverpool, Brown Bros. & Co.; 125 cs. chloride, Liverpool, Wing & Evans; 20 csk. perchlorate, Marseilles, C. W. Campbell & Co.

ALUM—30 csk. chrome, Hamburg, Hummel & Robinson.

ANTIMONY SULPHITE—8 csk., Hamburg, E. L. Bullock & Sons.

ANTIMONY OXIDE—100 bg., Hankow, Banque Belge l'Etranger; 500 bg., Hankow, China Hide & Prod. Co.

ANTHRACENE — 16 csk., Rotterdam, Lunham & Moore.

AMYLACETATE — 15 dr., Rotterdam, Lunham & Moore.

ARSENIC—16 csk., Rotterdam, Lunham & Moore; 203 bbl., Tampico, Am. Metal Co.; 371 cs., Kobe, J. D. Lewis; 250 cs., Kobe, Chipman Chem. Eng. Co.; 83 cs., Kobe, Collinge, Dawson & Co.; 20 cs., Kobe, Mackenzie & Foster; 283 cs., Kobe, S. W. Bridges & Co.; 149 cs., Kobe, Frazar & Co.; 140 cs., Kobe, Busk & Daniels; 230 cs., Kobe, Order; 100 cs., Yokohama, Mitsui & Co.

BARIUM OXIDE—131 csk., Hamburg, W. A. Brown & Co.

BARYTES—401 bg., Bremen, N. Y. Trust Co.; 106 csk., Bremen, Order.

BRONZE POWDER — 84 cs., Bremen, Baer Bros.; 20 cs., Hamburg, J. E. Mandlik.

CAMPHOR — 100 cs. crude, Shanghai, Suzuki & Co.; 80 cs., Kobe, Suzuki & Co.

CASEIN—109 bg., Hamburg, D. C. Andrews & Co.; 141 bg., Havre, Medit. & Gen. Traders; 100 bg., Havre, Monite Waterproof Glue Co.; 162 bg., Havre, Nat'l City Bank; 481 bg., Melbourne, Order; 340 bg., Auckland, A. Klipstein & Co.; 677 bg., Auckland, Asia Banking Corp.; 630 sk., Wellington, Bankers Trust Co.; 1,669 bg., Buenos Aires, T. M. Duche & Sons.

CALCIUM CHLORIDE—100 bbl., Hamburg, Roessler & Hasslacher Chem. Co.

CHEMICALS — 181 dr., London, Mallinckrodt Chem. Works; 1,000 bg., Bremen, A. Klipstein & Co.

CHALK—600 tons, London, Order; 500 tons, Dunkirk, J. W. Higman Co.; 1,645 tons, Dunkirk, Taintor Trading Co.; 1,350 bg., Antwerp, Irving Bank-Col. Trust Co.; 1,078 pkg. precipitated, Bristol, H. J. Baker & Bro.; 510 tons, Bristol, Paper Makers' Mfg. Co.; 300 tons, London, Baring Bros. & Co.; 25 csk. precipitated, Bristol, McKesson & Robbins; 50 csk. do., Bristol, Schieffelin & Co.

COLORS—96 csk. aniline, Havre, Ciba Co.; 14 pkg. ultramarine, Liverpool, Fezandie & Spearle; 2 csk. aniline, Liverpool, Kuthroff, Pickhardt & Co.; 5 csk., Rotterdam, H. A. Metz & Co.; 5 bbl., Rotterdam, Kuthroff, Pickhardt & Co.; 119 bbl. aniline, Barcelona, Nat'l Aniline & Chem. Co.

COPPER OXIDE—50 dr., Hamburg, Order.

COPPER SULPHATE—200 csk., Swansea, Order; 50 csk., Bristol, Farmers' Loan & Trust Co.; 120 bbl., Marseilles, Order.

COPPERAS — 23 csk. green, Swansea, Order.

COPRA—4,857 bg., Papeete, A. B. Donald; 265 bg., Anns Bay, Franklin Baker & Co.

CRESOL—3 dr. ortho, Liverpool, W. E. Jordan & Bro.

CUTCH—2,200 bg., Singapore, Order.

DIVI-DIVI — 517 bg., Curacao, Selma Merc. Corp.

DEGRAS—90 bbl., Antwerp, Order.

EPSOM SALT—1,000 bg., Bremen, E. Suter & Co.

FERRO-CHROME — 26 csk., Hamburg, D. Heydemann & Co.; 106 tons, Hamburg, C. Hardy & Ruperti.

FULLERS EARTH—350 bg., Bristol, L. A. Salmon & Bro.

FUSEL OIL—8 dr., Belfast, Order; 14 bbl., Hamburg, Order; 11 dr., Libau, Order; 45 dr., Hamburg, Order; 16 dr., Antwerp, Order; 45 dr., Rotterdam, Credito Italo; 15 dr., Dairen, F. Naidatcha; 18 dr., Rotterdam, Walford Fwdg. Corp.

GAMBIER—109 cs., Singapore, Order.

GLYCERINE—15 dr., Havana, Harshaw, Fuller & Goodwin Co.

GLAUBERS SALT—125 bbl., Hamburg, Roessler & Hasslacher Chem. Co.; 104 bbl., Hamburg, Farmers' Loan & Trust Co.

GUMS—57 bg. copal, Havre, L. C. Gillespie & Sons; 67 bg. damar, London, Baring Bros. & Co.; 400 bg. arabic, Sudan, Brown Bros. & Co.; 500 bg. do., Sudan, T. M. Duche & Sons; 2,455 bg. do., Sudan, Thurston & Braidich; 550 bg. do., Sudan, Order; 350 bg. arabic, Sudan, Irving Bank-Col. Trust Co.; 350 bg. arabic, Sudan, Carcacanda Bros.; 500 bg. arabic, Sudan, Anderson-Hillier Co.; 1,127 bg. yacca, Adelaide, Order; 179 pkg. damar, Singapore, Baring Bros. & Co.; 210 bg. arabic, Sudan, Guaranty Trust Co.; 100 bg. arabic, Sudan, Anglo-Egypt Bank; 100 bg. do., Sudan, Order; 327 sk. kauri, Auckland, Baring Bros. & Co.; 82 cs. do., Auckland, Equitable Trust Co.; 230 cs. do. Auckland, Asia Banking Corp.; 368 cs. do., Auckland, J. D. Lewis.; 732 pkg. do., Auckland, Order; 400 bg. yacca, Adelaide Baring Bros. & Co; 50 cs. damar, Singapore, L. C. Gillespie & Sons; 240 pkg. damar and 70 bg. copal, Singapore, Baring Bros. & Co.; 100 cs. damar and 50 cs. copal, Singapore, Irving Bank-Col. Trust Co.; 119 pkg. copal, Singapore, Kidder, Peabody & Co.; 455 pkg. copal, Singapore, Order; 300 cs. damar, Batavia, Bank of the Manhattan Co.; 50 cs. damar, Batavia, Irving Bank-Col. Trust Co.; 100 cs. damar, Batavia, Bank of N. Y.; 100 cs. do., Batavia, Central Union Trust Co.; 50 cs. do., Padang, Order.

IRON OXIDE—89 csk., Liverpool, Reichard-Coulston, Inc.; 52 csk., Liverpool, J. A. McNulty; 69 csk., Malaga, Reichard-Coudston, Inc.; 62 csk., Malaga, E. M. & F. Waldo; 119 bbl., Malaga, C. K. Williams & Co.; 228 bbl., Malaga, Hummel & Robinson; 20 bbl., Malaga, Nat'l City Bank.

LITHOPONE — 501 csk., Antwerp, B. Moore & Co.; 100 csk., Antwerp, E. M. & F. Waldo; 100 csk., Antwerp, A. Klipstein & Co.; 60 csk., Rotterdam, F. M. Witherill.

MAGNESITE—80,805 bg., Trieste, Am. Refractories Co.; 103 csk., Rotterdam, Speiden, Whitefield & Co.

MYRABOLANS—1,359 bg., Vizagapatam, Br. Bank of South Am.; 20,416 pkt., Calcutta, Order; 5,600 pkt., Calcutta, First Nat'l Bank of Boston.

MANGROVE BARK—15,961 bg., Morondava, Order; 626 bg., Majunga, Order.

NAPHTHALENE—972 bg., Rotterdam, Lunham & Moore; 331 bg., Rotterdam, Jayne & Sidebottom; 317 bg., Bristol, Order; 80 cs., Hamburg, Order; 290 bg., Bristol, Barrett Co.; 165 bg., London, Order; 2,349 bg., Rotterdam, Lunham & Moore

NICKEL OXIDE — 30 cs., Hamburg, Roessler & Hasslacher Chem. Co.

NICKEL SULPHATE—94 csk., Swansea, Order.

OCHRE—24 bbl., Seville, C. J. Osborn & Co.

OILS—**China Wood**—96 bbl., Hankow, Nat'l City Bank; 370 csk., Hankow, Viele, Blackwell & Buck; 1,200 bbl., Hankow, Order. **Coconut**—1,250 tons, Manila, Philippine Refining Corp.; 799 tons, Manila, Spencer, Kellogg & Sons. **Cod**—300 csk., St. Johns, R. Badcock & Co.; 160 csk., St. Johns, Nat'l Oil Products Co.; 200 bbl., Kobe, Cook & Swan Co. **Linseed**—50 bbl., London, Order; 173 bbl., Antwerp, Fontana Bros.; 288 bbl., Rotterdam, L. & E. Frenkel; 80 bbl., Rotterdam, W. Benkert & Co.; 144 bbl., Rotterdam, Lockwood & Co.; 318 bbl., Rotterdam, J. D. Lewis; 145 bbl., Rotterdam, Meteor Products Co.; 583 bbl., Rotterdam, Order; 140 bbl., Rotterdam, Elbert & Co. **Olive Foots** (sulphur oil)—100 bbl., Palermo, Order; 100 bbl., Catania, Order; 100 bbl., Bari, Brown Bros. & Co.; 100 bbl., Bari, Banco Comm. Ital.; 600 bbl., Bari, Irving Bank-Col. Trust Co.; 800 bbl., Bari, Nat'l City Bank; 100 bbl., Bari, Order; 300 bbl., Seville, W. R. Grace & Co.; 500 bbl., Seville, Deevsnap & Co. **Olive** (denatured)—175 bbl., Bari, Nat'l City Bank. **Palm**—159 csk., Lagos, J. Holt & Co.; 1,402 csk., Liverpool, D. Bacon; 160 csk., Liverpool, Nat'l City Bank; 17 csk., Liverpool, African & Eastern Trading Co.; 467 csk., Liverpool, Nat'l Bank of Commerce; 84 csk., Liverpool, Order; 289 csk., Hamburg, African & Eastern Trading Corp.; 86 csk., Hamburg, Order. **Rapeseed**—256 bbl., Liverpool, Vacuum Oil Co. **Whale**—150 bbl., Hamburg, Order. **Peanut**—15 bbl., Antwerp, Hunnel & Co. **Perilla**—625 bbl., Dairen, Cook & Swan Co.; 300 bbl., Dairen, Balfour-Williamson & Co.; 500 bbl., Kobe, Balfour-Williamson & Co.; 1,280 bbl., Kobe, Cook & Swan Co.

OIL SEEDS — **Castor** — 27,320 bg., Cocanada, Order. **Linseed**—72,991 bg., St. Lucia, Bank of the Manhattan Co.; 42,634 bg., Ibicuy, Am. Linseed Co.; 47,992 bg. and 2,634,373 kilos in bulk, Montevideo, Order; 48,020 bg. and 1,932,035 kilos in bulk, Rosario, Spencer Kellogg & Sons; 105,145 bg. Rosario, Order; 48,963 bg. and 2,602 tons in bulk, Rosario, Order; 8,413 bg., Buenos Aires, L. Dreyfus & Co.; 33,413 bg., Buenos Aires, Order.

POTASSIUM SALTS—38 csk. red prussiate, Hamburg, E. Suter & Co.; 1,000 csk. chlorate, Hamburg, A. J. Marcus, Inc.; 135 dr. permanganate, Hamburg, Order; 62 bbl. caustic, Hamburg, Order; 4,000 bg. sulphate, Bremen, Potash Import Corp.; 20 bbl. perchlorate, Swansea, Order; 18 bbl. hydrate, Hamburg, A. J. Marcus, Inc.; 6,000 csk. chlorate, Hamburg, Order; 6 dr. salts, London, Mager, Sonderburg Co.; 40 cs. caustic, Gothenburg, Mallinckrodt Chem. Works; 500 csk. chlorate, Marseilles, C. W. Campbell & Co.; 500 csk. chlorate, Marseilles, Asia Banking Corp.; 100 cs. perchlorate, Marseilles, Order.

PYRITES—7,815,810 kilos, Huelva, Pyrites Co.

QUEBRACHO—1,024 bg., Buenos Aires, Order.

QUICKSILVER—14 fl., Hampico, I. Elizondo; 400 fl., Seville, Huisking & Co.; 300 fl., Seville, H. W. Peabody & Co.; 1,000 fl., Alicante, Order.

SAL AMMONIAC — 87 csk., Hamburg. Meteor Products Co.; 20 csk. and 10 bbl., Bristol, C. de P. Field.

SHELLAC—18 cs. garnet, Hamburg, A. Murphy & Co.; 35 bg., Hamburg, Kasebier-Chatfield Shellac Co.; 100 cs., London, London & Liverpool Bank; 100 cs., London, Order; 350 bg. and 1,050 bg. refuse, Calcutta, Bank of the Manhattan Co.; 150 bg., Calcutta, Brown Bros. & Co.; 625 bg., Calcutta, Chase Nat'l Bank; 722 bg. and 214 bg. button, Calcutta, Order; 115 cs. sticklac, Bangkok, Order; 100 bg., Calcutta, Brown Bros. & Co.; 450 bg., Calcutta, First Nat'l Bank of Boston; 300 bg., Calcutta, London & Brazil Bank; 50 bg., Calcutta, Br. Bank of West Africa; 100 bg., Calcutta, N. Y. Trust Co.; 255 bg., Calcutta, Standard Bank of S. A.; 150 pkg., Calcutta, Iwai, Ltd.; 1,256 bg., Calcutta, Order; 25 bg. garnet lac, Hamburg, Order.

SODIUM SALTS—40 cs. bromide, Hamburg, R. W. Greeff & Co.; 130 bg. silicate, Danzig, Hardy & Ruperti; 100 dr. sulphite, Bristol, R. F. Downing & Co.; 336 cs. cyanide, Havre, Nat'l City Bank; 24 csk. prussiate, Liverpool, H. J. Baker & Bros.; 28,067 bg. nitrate, Antofagasta, W. R. Grace & Co.; 10,885 bg. nitrate, Iquique, W. R. Grace & Co.; 120 dr. sulphite, Bristol, R. F. Downing & Co.; 17 csk. prussiate, Rotterdam, Order; 336 cs. cyanide, Marseilles, Nat'l City Bank; 437 csk. hyposulphite, Marseilles, Order.

STARCH — 500 bg. potato, Rotterdam, Twenesche Bank; 700 bg. do., Rotterdam, Stein, Hall & Co.; 1,250 bg. do., Rotterdam, Order.

SUMAC—200 bl., Palermo, Order; 45 csk. extract, Glasgow, Am. Dyewood Co.

TALLOW—130 tc., Sydney, Nat'l City Bank; 120 csk., Brisbane, Order; 87 pipes, Melbourne, Order; 100 csk., Lyttelton, Tupman, Thurlow & Co.; 298 tc., Buenos Aires, Armour & Co.

TARTAR—89 sk., Tarragona, C. Pfizer & Co.; 667 sk., Valencia, C. Pfizer & Co.; 649 sk., Valencia, Royal Baking Powder Co.; 405 sk., Marseilles, Tartar Chem. Works; 352 sk., Marseilles, C. Pfizer & Co.

TURMERIC—178 bg., Cochin, Order; 900 bg., Alleppey, Order; 660 bg., Cochin, Order.

VEGETABLE TALLOW — 500 pkg., Shanghai, Equitable Trust Co.

WATTLE BARK—9,707 bl., Durban, E. J. Haley, Inc.; 1,999 bg., Durban, Bona Allen, Inc.

WAXES—42 pkg. bees, Lisbon, E. A. Brummel & Co.; 212 pkg. do., Lisbon, Strohmeyer & Arpe Co.; 168 pkg. bees, Lisbon, Order; 16 bg. bees, Talcahuano, W. R. Grace & Co.; 88 bg. do., Talcahuano, Strohmeyer & Arpe Co.; 14 bg. do., Talcahuano, Order; 84 bg. do., Valparaiso, Strohmeyer & Arpe Co.; 74 bg. do., Valparaiso, W. R. Grace & Co.; 40 bg. bees, London, Order.

ZINC DUST—100 cs., Yokohama, Mitsui & Co.

ZINC SULPHIDE—2 csk., London, C. A. Sykes; 6 csk., Rotterdam, E. L. Bullock & Sons.

ZINC WHITE — 200 bbl., Marseilles, Reichard-Coulston, Inc.; 55 bbl., Marseilles, Order.

ZYLOL—12 dr., Rotterdam, Lunham & Moore.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

General Chemicals

Acetic anhydride, 85%, drums	lb.	$0.38 –	....
Acetone, drums	lb.	.25 –	.25½
Acid, acetic, 28%, bbl.	100 lb.	3.38 –	3.50
Acetic, 56%, bbl.	100 lb.	6.75 –	7.00
Glacial, 99½%, bbl.	100 lb.	12.00 –	12.50
Boric, bbl.	lb.	.10½ –	
Citric, kegs	lb.	.49 –	.52
Formic, 85%	lb.	.14 –	.16
Gallic, tech	lb.	.45 –	.50
Hydrofluoric, 52%, carboys	lb.	.12 –	.12½
Lactic, 44%, tech., light, bbl.	lb.	.11½ –	.12
22% tech., light, bbl.	lb.	.05½ –	.06
Muriatic, 18° tanks	100 lb.	.90 –	1.00
Muriatic, 20°, tanks	100 lb.	1.00 –	1.10
Nitric, 36°, carboys	lb.	.04½ –	.05
Nitric, 42°, carboys	lb.	.06 –	.06½
Oleum, 20%, tanks	ton	18.50 –	19.00
Oxalic, crystals, bbl.	lb.	.13½ –	.13¾
Phosphoric, 50% carboys	lb.	.07½ –	.08½
Pyrogallic, resublimed	lb.	1.50 –	1.60
Sulphuric, 60°, tanks	ton	9.50 –	11.00
Sulphuric, 60°, drums	ton	13.00 –	14.00
Sulphuric, 66°, tanks	ton	16.00 –	16.50
Sulphuric, 66° drums	ton	20.00 –	21.00
Tannic, U.S.P., bbl.	lb.	.65 –	.70
Tannic, tech., bbl.	lb.	.45 –	.50
Tartaric, imp., powd., bbl.	lb.	.36½ –	....
Tartaric, domestic, bbl.	lb.	.37½ –	....
Tungstic, per lb.	lb.	1.10 –	1.20
Alcohol, butyl, drums, f.o.b. works	lb.	.26 –	.28
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.75 –	4.95
Ethyl, 190 p'f. U.S.P., bbl.	gal.	4.70 –	....
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 190 proof			
No. 1, special bbl.	gal.	.41 –	...
No. 1, 190 proof, special, dr.	gal.	.35 –	...
No. 1, 188 proof, bbl	gal.	.42 –	...
No. 1, 188 proof, dr	gal.	.36 –	...
No. 5, 188 proof, bbl.	gal.	.40 –	...
No. 5, 188 proof, dr	gal.	.34 –	...
Alum, ammonia, lump, bbl.	lb.	.03½ –	.03¾
Potash, lump, bbl.	lb.	.02¾ –	.03¼
Chrome, lump, potash, bbl.	lb.	.05½ –	.06
Aluminum sulphate, com., bags	100 lb.	1.50 –	1.65
Iron free bags	lb.	.02½ –	.02¾
Aqua ammonia, 26°, drums	lb.	.06½ –	.07¾
Ammonia, anhydrous, cyl.	lb.	.30 –	.30½
Ammonium carbonate, powd. casks, imported	lb.	.09½ –	.10
Ammonium carbonate, powd. domestic, bbl.	lb.	.13 –	.14
Ammonium nitrate, tech., casks	lb.	.10 –	.11
Amyl acetate tech., drums	gal.	3.50 –	3.75
Arsenic, white, powd., bbl.	lb.	.14½ –	.15
Arsenic, red, powd., kegs	lb.	.14½ –	.14¾
Barium carbonate, bbl.	ton	78.00 –	80.00
Barium chloride, bbl.	ton	85.00 –	90.00
Barium dioxide, drums	lb.	.18 –	.18½
Barium nitrate, casks	....	.08 –	.08½
Barium sulphate, bbl.	lb.	.04 –	.04¼
Blanc fixe, dry, bbl.	lb.	.04 –	.04½
Bleaching powder, f.o.b. wks., drums	100 lb.	1.90 –	....
Spot N. Y. drums	100 lb.	2.40 –	
Borax, bbl.	lb.	.05½ –	.05¾
Bromine, cases	lb.	.28 –	.30
Calcium acetate, bags	100 lb.	4.00 –	4.05
Calcium arsenate, dr.	lb.	.16½ —	.17
Calcium carbide, drums	lb.	.05½ –	.05¾
Calcium chloride, fused, drums	ton	22.00 –	23.00
Gran. drums	ton	28.00 –	30.00
Calcium phosphate, mono, bbl.	lb.	.06½ –	.07
Camphor, cases	lb.	.86 –	.88
Carbon bisulphide, drums	lb.	.07 –	.07½
Carbon tetrachloride, drums	lb.	.09½ –	.10
Chalk, precip.—domestic, light, bbl.	lb.	.04½ –	.04¾
Domestic, heavy, bbl.	lb.	.03½ –	.03¾
Imported, light, bbl.	lb.	.04½ –	.05
Chlorine, liquid, tanks, wks.	lb.	.05¾ –	.05½
Cylinders, 100 lb., wks	lb.	.06 –	.06½
Cylinders, 100 lb., spot	lb.	.09 –	....
Chloroform, tech., drums	lb.	.35 –	.38
Cobalt oxide, bbl.	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks.	ton	19.00 –	20.00
Copper carbonate, bbl.	lb.	.19 –	.20
Copper cyanide, drums	lb.	.47 –	.50
Coppersulphate, dom., bbl.,	100 lb.	6.00 –	6.25
Cream of tartar, bbl.	lb.	.25½ –	.26½
Epsom salt, dom., tech., bbl.	100 lb.	1.90 –	2.15
Epsom salt, imp., tech., bags	100 lb.	.90 –	1.00
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.50 –	2.60
Ether, U.S.P., drums	lb.	.13 –	.15
Ethyl acetate, 85%, drums	gal.	.80 –	.81
Ethyl acetate, pure (acetic ether, 98% to 100%)	gal.	.95 –	1.00
Formaldehyde, 40%, bbl.	lb	$0.14½ –	$0.15¼
Fullers earth—imp., powd., net	ton	30.00 –	32.00
Fusel oil, ref., drums	gal.	3.55 –	4.05
Fusel oil, crude, drums	gal.	2.50 –	2.60
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Glaubers salt, imp., bags	100 lb.	.90 –	.95
Glycerine, c.p., drums extra	lb.	.17 –	.17½
Glycerine, dynamite, drums	lb.	.15½ –	.16
Glycerine, crude 80%, loose	lb	.11	.11¼
Iodine, resublimed	lb.	4.55 –	4.65
Iron oxide, red, casks	lb.	.12 –	.18
Lead:			
White, basic carbonate, dry, casks	lb.	.09¾ –	.10
White, basic sulphate, casks	lb.	.09¼ –	......
White, in oil, kegs	lb.	.12¼ –	.14
Red, dry, casks	lb.	.11½ –	.12
Red, in oil, kegs	lb.	.13½ –	.15
Lead acetate, white crys., bbl.	lb.	.14 –	.14½
Brown, broken, casks	lb.	.13 –	.13½
Lead arsenate, powd., bbl.	lb.	.23 –	.24
Lime-Hydrated, bbl.	per ton	16.80 –	17.00
Lime, Lump, bbl	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.10¾ –	.11
Lithophone, bags	lb.	.07 –	.07¼
in bbl.	lb.	.07 –	.07¾
Magnesium carb., tech., bags	lb.	.08 –	.08½
Methanol, 95%, bbl.	gal.	1.18 –	1.20
Methanol, 97%, bbl.	gal.	1.20 –	1.22
Nickel salt, double, bbl.	lb.	.10½ –	....
Nickel salts, single, bbl.	lb.	.11½ –	....
Phosgene	....	.60 –	.75
Phosphorus, red, cases	lb.	.35 –	.40
Phosphorus, yellow, cases	lb.	.30 –	.35
Potassium bichromate, casks	lb.	.11½ –	.12
Potassium bromide, gran., bbl.	lb.	.19 –	.20
Potassium carbonate, 80-85%, calcined, casks	lb.	.06½ –	.06¾
Potassium chlorate, powd.	lb.	.07½ –	.08
Potassium cyanide, drums	lb.	.45 –	.50
Potassium, first sorts, cask	lb.	.08½	.09
Potassium hydroxide (caustic potash) drums	lb.	.07½ –	.09
Potassium iodide, cases	lb.	3.65 –	3.75
Potassium nitrate, bbl.	lb.	.06½ –	.07½
Potassium permanganate, drums	lb.	.18½ –	.19
Potassium prussiate, red, casks	lb.	.65 –	.67
Potassium prussiate, yellow, casks	lb.	.35½ –	.36½
Salammoniac, white, gran., casks, imported	lb.	.06½ –	.07
Salammoniac, white, gran., bbl., domestic	lb.	.07½ –	.07¾
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl.	100 lb.	1.20	1.40
Salt cake (bulk)	ton	26.00 –	28.00
Soda ash, light, 58% flat, bags, contract	100 lb.	1.60 –	1.67
Soda ash, light, basis, 48%, bags, contract, f.o.b. wks.	100 lb.	1.20 –	1.30
Soda ash, light, 58%, flat, bags, resale	100 lb.	1.75 –	1.80
Soda ash, dense, bags, contract, basis 48%	100 lb.	1.17½ –	1.20
Soda ash, dense, in bags, resale	100 lb.	1.85 –	1.90
Soda, caustic, 76%, solid, drums, f.a.s.	100 lb.	3.30 –	3.40
Soda, caustic, basis 60%, wks., contract	100 lb.	2.50 –	2.60
Soda, caustic, ground and flake, contracts	100 lb.	3.80 –	3.90
Soda, caustic, ground and flake, resale	100 lb.	3.72½ –	.....
Sodium acetate, works, bags	lb.	.05½ –	.06½
Sodium bicarbonate, bbl.	100 lb.	2.00 –	2.50
Sodium bichromate, casks	lb.	.08½ –	.09
Sodium bisulphate (niter cake)	ton	6.00 –	7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04¼ –	.04½
Sodium chlorate, kegs	lb.	.06½ –	.07
Sodium chloride	long ton	12.00 –	13.00
Sodium cyanide, cases	lb.	.20 –	.23
Sodium fluoride, bbl.	lb.	$0.09 –	$0.10½
Sodium hyposulphite, bbl.	lb.	.02½ –	.03
Sodium nitrite, casks	lb.	.08 –	.08½
Sodium peroxide, powd., cases	lb.	.28 –	.30
Sodium phosphate, dibasic, bbl.	lb.	.03½ –	.04
Sodium prussiate, yel. drums	lb.	.16 –	.16½
Sodium salicylic, drums	lb.	.47 –	.52
Sodium silicate (40°, drums)	100 lb.	.80 –	1.25
Sodium silicate (60°, drums)	100 lb.	2.00 –	2.25
Sodium sulphide, fused, 60-62% drums	lb.	.04½ –	.04¾
Sodium sulphite, crys., bbl.	lb.	.03½ –	.03¾
Strontium nitrate, powd., bbl.	lb.	.12½ –	.13
Sulphur chloride, yel drums	lb.	.04½ –	.05
Sulphur, crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Sulphur, flour, bag	100 lb.	2.25 –	2.35
Sulphur, roll, bag	100 lb.	2.00 –	2.10
Sulphur dioxide, liquid, cyl.	lb.	.08 –	.08½
Talc—imported, bags	ton	30.00 –	40.00
Talc—domestic powd., bags	ton	18.00 –	25.00
Tin bichloride, bbl.	lb.	.12½ –	.13¾
Tin oxide, bbl.	lb.	.48 –	....
Tin crystals, bbl.	lb.	.35½ –	.36
Zinc carbonate, bags	lb.	.14 –	.14½
Zinc chloride, gran, bbl.	lb.	.06½ –	.06¾
Zinc cyanide, drums	lb.	.37 –	.38
Zinc oxide, lead free, bbl.	lb.	.08 –	.08½
5% lead sulphate, bags	lb.	.07½ –	......
10 to 35% lead sulphate, bags	lb.	.07 –	......
French, red seal, bags	lb.	.09¾ –	......
French, green seal, bags	lb.	.10¾ –	......
French, white seal, bbl.	lb.	.12 –	......
Zinc sulphate, bbl.	100 lb.	2.50 –	3.00

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.65 –	$0.80
Alpha-naphthol, ref., bbl.	lb.	.75 –	.90
Alpha-naphthylamine, bbl.	lb.	.35 –	37
Aniline oil, drums	lb.	.16 –	.16½
Aniline salts, bbl.	lb.	.23 –	.24
Anthracene, 80%, drums	lb.	.75 –	1.00
Anthracene, 80%, imp., drums, duty paid	lb.	.70 –	.75
Anthraquinone, 25%, paste, drums	lb.	.70 –	.75
Benzaldehyde U.S.P., carboys	lb.	1.40 –	1.45
tech, drums	lb	75	80
Benzene, pure, water-white, tanks and drums	gal.	.30 –	.32
Benzene, 90%, tanks & drums	gal.	.27 –	.30
Benzene, 90%, drums, resale	gal.	.30 –	.33
Benzidine base, bbl.	lb.	.85 –	.90
Benzidine sulphate, bbl.	lb.	.70 –	.75
Benzoic acid, U.S.P., kegs	lb.	.72 –	75
Benzoate of soda, U.S.P., bbl.	lb.	.57 –	.65
Benzyl chloride, 95-97%, ref., drums	lb.	.45 –	...
Benzyl chloride, tech., drums	lb.	.30 –	..35
Beta-naphthol, tech., bbl.	lb.	.22 –	.23
Beta-naphthylamine, tech	lb.	.80 –	.90
Cresol, U.S.P., drums	lb.	.25 –	.29
Ortho-cresol, drums	lb.	.28 –	.30
Cresylic acid, 97%, resale, drums	gal.	1.20 –	....
95-97%, drums, resale	gal.	1.10 –	....
Dichlorbenzene, drums	lb.	.07 –	.09
Diethylaniline, drums	lb.	.50 –	.60
Dimethylaniline, drums	lb.	.42 –	.43
Dinitrobenzene, bbl,	lb.	.19 –	.20
Dinitroclorbenzenee bbl.	lb.	.22 –	.23
Dinitronaphthalen, bbl.	lb.	.30 –	.32
Dinitrophenol, bbl.	lb.	.35 –	.40
Dinitrotoluene, bbl.	lb.	.20 –	.22
Dip oil, 25%, drums	gal.	.25 –	.30
Diphenylamine, bbl.	lb.	.50 –	.52
H-acid, bbl.	lb.	.80 –	.85
Meta-phenylenediamine, bbl.	lb.	1.00 –	1.05
Michlers ketone, bbl.	lb.	3.00 –	3.50
Monochlorbenzene, drums	lb.	.08 –	.10
Monoethylaniline, drums	lb.	.95 –	1.10
Naphthalene, flake, bbl.	lb.	.08¾ –	.09
Naphthalene, balls, bbl.	lb.	.09½ –	.10
Naphthionate of soda, bbl.	lb.	.58 –	.65
Naphthionic acid, crude, bbl.	lb.	.55 –	.60
Nitrobenzene, drums	lb.	.10 –	.12
Nitro-naphthalene, bbl.	lb.	.30 –	.35
Nitro-toluene, drums	lb.	.15 –	.17
N-W acid, bbl.	lb.	1.25 –	1.30
Ortho-amidophenol, kegs	lb.	2.30 –	2.35
Ortho-dichlorbenzene, drums	lb.	.17 –	.20
Ortho-nitrophenol, bbl.	lb.	.90 –	.92
Ortho-nitrotoluene, drums	lb.	.10 –	.12
Ortho-toluidine, bbl.	lb.	.14 –	.15
Para-amidophenol, base, kegs	lb.	1.20 –	1.30
Para-amidophenol, HCl, kegs	lb.	1.25 –	1.35
Para-dichlorbenzene, bbl.	lb.	.17 –	.20
Paranitroaniline, bbl.	lb.	.72 –	.75
Para-nitrotoluene, bbl.	lb.	.60 –	.65
Para-phenylenediamine, bbl.	lb.	1.45 –	1.50
Para-toluidine, bbl	lb.	.95 –	.98
Phthalic anhydride, bbl.	lb.	.35 –	.38
Phenol, U.S.P., drums	lb.	.50 –	.52
Picric acid, bbl.	lb.	.20 –	.22
Pyridine, dom., drums	gal.	nominal	

Pyridine, imp., drums	gal.	$2.50 - $2.75
Resorcinol, tech., kegs	lb.	1.40 - 1.50
Resorcinol, pure, kegs	lb.	2.00 - 2.25
R-salt, bbl.	lb.	.55 - .60
Salicylic acid, tech., bbl.	lb.	... - .42
Salicylic acid, U.S.P., bbl.	lb.	.40 - .45
Solvent naphtha, water-white, drums	gal.	.37 - .40
Crude, drums	gal.	.24 - ...
Sulphanilic acid, crude, bbl.	lb.	.18 - .20
Thiocarbanilide, kegs	lb.	.35 - .38
Toluidine, kegs	lb.	1.20 - 1.30
Toluidine, mixed, kegs	lb.	.30 - .35
Toluene, tank cars	gal.	.30 - .35
Toluene, drums	gal.	.35 - .40
Xylidines, drums	lb.	.47 - .49
Xylene, pure, drums	gal.	.75 - 1.00
Xylene, com., drums	gal.	.37 - ...
Xylene, com., tanks	gal.	.32 - ...

Naval Stores

Rosin B-D, bbl.	280 lb.	$5.85 - ...
Rosin E-I, bbl.	280 lb.	5.95 - ...
Rosin K-N, bbl.	280 lb.	6.15 - ...
Rosin W.G.-W.W., bbl.	280 lb.	6.50 - 7.50
Wood rosin, bbl.	280 lb.	6.00 - 6.10
Turpentine, spirits of, bbl.	gal.	1.12 - 1.14
Wood, steam dist., bbl.	gal.	1.00 - ...
Wood, dest. dist., bbl.	gal.	.75 - ...
Pine tar pitch, bbl.	200 lb.	... - 6.00
Tar, kiln burned, bbl.	500 lb.	... - 13.00
Retort tar, bbl.	500 lb.	... - 12.00
Rosin oil, first run, bbl.	gal.	.45 - ...
Rosin oil, second run, bbl.	gal.	.48 - ...
Rosin oil, third run, bbl.	gal.	.52 - ...
Pine oil, steam dist.	gal.	.75 - ...
Pine oil, pure, dest. dist.	gal.	.70 - ...
Pine tar oil, ref.	gal.	.48 - ...
Pine tar oil, crude, tanks f.o.b. Jacksonville, Fla.	gal.	.32 - .32½
Pine tar oil, double ref., bbl.	gal.	... - .75
Pine tar, ref., thin, bbl.	gal.	... - .25
Pinewood creosote, ref., bbl.	gal.	... - .52

Animal Oils and Fats

Degras, bbl.	lb.	$0.03¾ - $0.04½
Grease, yellow, bbl.	lb.	.06½ - .06¾
Lard oil, Extra No. 1, bbl.	gal.	.90 - .92
Neatsfoot oil, 20 deg. bbl.	gal.	1.30 - ...
No. 1, bbl.	gal.	.92 - .94
Oleo Stearine		.09 - ...
Red oil, distilled, d.p. bbl.	lb.	.10½ - .10¾
Saponified, bbl.	lb.	.10½ - .10¾
Tallow, extra, loose	lb.	.07¾ - ...
Tallow oil, acidless, bbl.	gal.	.94 - .96

Vegetable Oils

Castor oil, No. 3, bbl.	lb.	$0.14 - ...
Castor oil, No. 1, bbl.	lb.	.14½ - ...
Chinawood oil, bbl.	lb.	.26 - .28
Coconut oil, Ceylon, bbl.	lb.	.09½ - ...
Ceylon, tanks, N.Y.	lb.	.08½ - ...
Coconut oil, Cochin, bbl.	lb.	.10 - .10½
Corn oil, crude, bbl.	lb.	.12½ - ...
Crude, tanks, (f.o.b. mill)	lb.	.09½ - .09¾
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.09¾ - ...
Summer yellow, bbl.	lb.	.12¼ - ...
Winter yellow, bbl.	lb.	.13¼ - .13½
Linseed oil, raw, car lots, bbl.	gal.	1.13 - 1.14
Raw, tank cars (dom.)	gal.	1.08 - 1.09
Boiled, cars, bbl. (dom.)	gal.	1.15 - 1.16
Olive oil, denatured, bbl.	gal.	1.10 - ...
Sulphur, (foots) bbl.	lb.	.09 - .09½
Palm, Lagos, casks	lb.	.07½ - .07¾
Niger, casks	lb.	.07 - .07½
Palm kernel, bbl.	lb.	.08½ - .08¾
Peanut oil, crude, tanks (mill)	lb.	.13½ - ...
Peanut oil, refined, bbl.	lb.	.16½ - ...
Perilla, bbl.	lb.	.16 - .16½
Rapeseed oil, refined, bbl.	gal.	.83 - .84
Rapeseed oil, blown, bbl.	gal.	.88 - .89
Sesame, bbl.	lb.	.11½ - .12½
Soya bean (Manchurian), bbl.	lb.	.12½ - .13
Tank, f.o.b. Pacific coast	lb.	.10½ - .10¾
Tank, (f.o.b. N.Y.)	lb.	.10½ - .10¾

Fish Oils

Cod, Newfoundland, bbl.	gal.	$0.70 - $0.72
Menhaden, light pressed, bbl.	gal.	.76 - ...
White bleached, bbl.	gal.	.78 - ...
Blown, bbl.	gal.	.82 - ...
Crude, tanks (f.o.b. factory)	gal.	.50 - ...
Whale No. 1 crude, tanks, coast	lb.	... - ...
Winter, natural, bbl.	gal.	.76 - .78
Winter, bleached, bbl.	gal.	.79 - .80

Oil Cake and Meal

Coconut cake, bags	ton	$30.00 - $31.00
Copra, sun dried, bags, (c.i.f.)	lb.	.05¼ - .05½
Sun dried Pacific coast	lb.	.05¼ - .05½
Cottonseed meal, f.o.b. mills	ton	38.00 - ...
Linseed cake, bags	ton	34.50 - ...
Linseed meal, bags	ton	36.50 - ...

Dye & Tanning Materials

Albumen, blood, bbl.	lb.	$0.45 - $0.50
Albumen, egg, tech, kegs	lb.	.90 - .95
Cochineal, bags	lb.	.33 - .35
Cutch, Borneo, bales	lb.	.04½ - .05
Cutch, Rangoon, bales	lb.	.13 - .13½
Dextrine, corn, bags	100 lb.	3.69 - 4.01
Dextrine, gum, bags	100 lb.	3.99 - 4.09
Divi-divi, bags	ton	38.00 - 39.00
Fustic, sticks	ton	30.00 - 35.00
Fustic, chips, bags	lb.	.04 - .05
Logwood, sticks	ton	26.00 - 30.00
Logwood, chips, bags	lb.	.02½ - .03½
Sumac, leaves, Sicily, bags	ton	70.00 - 72.00
Sumac, ground, bags	ton	$65.00 - $67.00
Sumac, domestic, bags	ton	40.00 - 42.00
Starch, corn, bags	100 lb.	2.97 - 3.07
Tapioca flour, bags	lb.	.06 - .06½

Extracts

Archil, conc., bbl.	lb.	$0.17 - $0.18
Chestnut, 25% tannin, tanks	lb.	.02 - .03
Divi-divi, 25% tannin, bbl.	lb.	.04 - .05
Fustic, crystals, bbl.	lb.	.20 - .22
Fustic, liquid, 42°, bbl.	lb.	.08 - .09
Gambier, liq., 25% tannin, bbl.	lb.	.08 - .09
Hematine crys., bbl.	lb.	.14 - .18
Hemlock, 25% tannin, bbl.	lb.	.04 - .05
Hypernic, solid, drums	lb.	.24 - .26
Hypernic, liquid, 51°, bbl.	lb.	.10 - .12
Logwood, crys., bbl.	lb.	.18 - .20
Logwood, liq., 51°, bbl.	lb.	.09 - .10
Quebracho, solid, 65% tannin, bbl.	lb.	.04½ - .05
Sumac, dom., 51°, bbl.	lb.	.06½ - .07

Dry Colors

Blacks-Carbongas, bags, f.o.b. works	lb.	$0.20 - $0.24
Lampblack, bbl.	lb.	.12 - .40
Mineral, bulk	ton	35.00 - 45.00
Blues-Bronze, bbl.	lb.	.55 - .60
Prussian, bbl.	lb.	.55 - .60
Ultramarine, bbl.	lb.	.08 - .35
Browns, Sienna, Ital., bbl.	lb.	.06 - .14
Sienna, Domestic, bbl.	lb.	.03½ - .04
Umber, Turkey, bbl.	lb.	.04 - .04½
Greens-Chrome, C.P. Light, bbl.	lb.	.32 - .34
Chrome, commercial, bbl.	lb.	.12 - .12½
Paris, bulk	lb.	.30 - .35
Reds, Carmine No. 40, tins	lb.	4.50 - 4.70
Oxide red, casks	lb.	.10 - .14
Para toner, kegs	lb.	1.00 - 1.10
Vermilion, English, bbl.	lb.	1.30 - 1.32
Yellow, Chrome, C.P. bbls.	lb.	.20 - .21
Ocher, French, casks	lb.	.02½ - .03

Waxes

Bayberry, bbl.	lb.	$0.35 - $0.36
Beeswax, crude, bags	lb.	.20 - .21
Beeswax, refined, light, bags	lb.	.32 - .34
Beeswax, pure white, cases	lb.	.40 - .41
Candelilla, bags	lb.	.21 - .22
Carnauba, No. 1, bags	lb.	.42 - .43
No. 2, North Country, bags	lb.	.23 - .23½
No. 3, North Country, bags	lb.	.18½ - .19
Japan, cases	lb.	.16½ - .16¾
Montan, crude, bags	lb.	.04½ - .04¾
Paraffine, crude, match, 105-110 m.p.	lb.	.04 - .04½
Crude, scale 124-126 m.p., bags	lb.	.02¾ - .03
Ref., 118-120 m.p., bags	lb.	.03 - .03½
Ref., 125 m.p., bags	lb.	.03½ - .03¾
Ref, 128-130 m.p., bags	lb.	.03¾ - .04
Ref., 133-135 m.p., bags	lb.	.04½ - .04¾
Ref., 135-137 m.p., bags	lb.	.05 - .05½
Stearic acid, sgle pressed, bags	lb.	.13 - .13½
Double pressed, bags	lb.	.13½ - .13¾
Triple pressed, bags	lb.	.15 - .15½

Fertilizers

Ammonium sulphate, bulk, f.o.b. works	100 lb.	$3.25 - $3.30
F.a.s. double bags	100 lb.	3.85 - 3.90
Blood, dried, bulk	unit	4.00 - ...
Bone, raw, 3 and 50, ground	ton	27.00 - 30.00
Fish scrap, dom., dried, wks.	unit	3.75 - ...
Nitrate of soda, bags	100 lb.	2.52½ - 2.57½
Tankage, high grade, f.o.b. Chicago	unit	3.35 - 3.45
Phosphate rock, f.o.b. mines, Florida pebble, 68-72%	ton	$4.00 - $4.50
Tennessee, 78-80%	ton	8.00 - 8.25
Potassium muriate, 80%, bags	ton	34.55 - ...
Potassium sulphate, bags basis 90%	ton	43.67 - ...
Double manure salt	ton	25.72 — ...
Kainit	ton	7.22 — ...

Crude Rubber

Para—Upriver fine	lb.	$0.27½ - ...
Upriver coarse	lb.	.23 - .23½
Upriver caucho ball	lb.	.24½ - .25
Plantation—First latex crepe	lb.	.27¾ - ...
Ribbed smoked sheets	lb.	.27¾ - ...
Brown crepe, thin, clean	lb.	.26½ - ...
Amber crepe No. 1	lb.	.27 - .27¼

Gums

Copal, Congo, amber, bags	lb.	$0.12 - $0.13
East Indian, bold, bags	lb.	.23 - .23½
Manila, pale, bags	lb.	.20 - .20½
Pontinak, No. 1 bags	lb.	.20 - .20½
Damar, Batavia, cases	lb.	.28 - .29
Singapore, No. 1, cases	lb.	.34 - .35
Singapore, No. 2, cases	lb.	.23 - .24
Kauri, No. 1, cases	lb.	.65 - .67
Ordinary chips, cases	lb.	.20 - .22
Manjak, Barbados, bags	lb.	.09 - .09½

Shellac

Shellac, orange fine, bags	lb.	$0.64 - ...
Orange superfine, bags	lb.	.66 - ...
A. C. garnet, bags	lb.	nominal
Bleached, bonedry	lb.	.73 - ...
Bleached, fresh	lb.	.61 - .62
T. N., bags	lb.	.60 - .61

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b., Quebec	sh. ton	$500.00 - ...
Asbestos, shingle, f.o.b., Quebec	sh. ton	$65.00 - $85.00
Asbestos, cement, f.o.b., Quebec	sh. ton	20.00 - 25.00
Barytes, grd., white, f.o.b. mills, bbl.	net ton	16.00 - 20.00
Barytes, grd., off-color, f.o.b. mills bulk	net ton	13.00 - 15.00
Barytes, floated, f.o.b. St. Louis, bbl.	net ton	28.00 - ...
Barytes, crude f.o.b. mines, bulk	net ton	10.00 - 11.00
Casein, bbl., tech.	lb.	.19½ - .23½
China clay (kaolin) crude, f.o.b. Ga.	net ton	7.00 - 9.00
Washed, f.o.b. Ga.	net ton	8.00 - 9.00
Powd., f.o.b. Ga.	net ton	14.00 - 20.00
Crude f.o.b. Va.	net ton	8.00 - 12.00
Ground, f.o.b. Va.	net ton	14.00 - 20.00
Imp., lump, bulk	net ton	15.00 - 20.00
Imp., powd.	net ton	45.00 - 50.00
Feldspar, No. 1 pottery	long ton	6.00 - 7.00
No. 2 pottery	long ton	4.00 - 5.50
No. 1 soap	long ton	7.00 - 7.50
No. 1 Canadian, f.o.b. mill	long ton	20.00 - 22.00
Graphite, Ceylon, lump, first quality, bbl.	lb.	.06½ - ...
Ceylon, chip, bbl.	lb.	.05½ - ...
High grade amorphous crude	ton	15.00 - 35.00
Gum arabic, amber, sorts, bags	lb.	.14½ - .15
Gum tragacanth, sorts, bags	lb.	.48 - .56
No. 1, bags	lb.	1.50 - 1.60
Kieselguhr, f.o.b. Cal.	ton	40.00 - 42.00
F.o.b. N. Y.	ton	50.00 - 55.00
Magnesite, crude, f.o.b. Cal.	ton	14.00 - 15.00
Pumice stone, imp., casks	lb.	.03 - .05½
Dom., lump, bbl.	lb.	.05 - .05½
Dom., ground, bbl.	lb.	.06 - .07
Silica, glass sand, f.o.b. Ind.	ton	2.00 - 2.50
Silica, sand blast, f.o.b. Ind.	ton	2.50 5.00
Silica, amorphous, 250-mesh, f.o.b. Ill.	ton	17.00 - 17.50
Silica, bldg. sand, f.o.b. Pa.	ton	2.00 - 2.75
Soapstone, coarse, f.o.b. Vt., bags	ton	7.00 - 8.00
Talc, 200 mesh, f.o.b., Vt., bags	ton	6.50 - 9.00
Talc, 200 mesh, f.o.b. Ga., bags	ton	7.00 - 9.00
Talc, 200 mesh, f.o.b. Los Angeles, bags	ton	16.00 - 20.00

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$3.25 - 3.50
Corning	bbl.	1.85 - ...
Cabell	bbl.	1.91 - ...
Somerset	bbl.	1.75 - ...
Illinois	bbl.	1.97 - ...
Indiana	bbl.	1.98 - ...
Kansas and Oklahoma, 28 deg.	bbl.	1.30 - ...
California, 35 deg. and up	bbl.	1.04 - ...

Gasoline, Etc.

Motor gasoline, steel bbls.	gal.	$0.21½ - ...
Naphtha, V. M. & P. deod, steel bbls.	gal	.20½ - ...
Kerosene, ref. tank wagon	gal.	.14 - ...
Bulk, W. W. export	gal.	.07 - ...
Lubricating oils:		
Cylinder, Penn., dark	gal.	.22 - .25
Bloomless, 30@31 grav.	gal.	.18½ - .20½
Paraffin, pale	gal.	.24 - .26
Spindle, 200, pale	gal.	.22 - .24
Petrolatum, amber, bbls.	lb.	.05 - .05½
Paraffine wax (see waxes)		

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	ton	$45-50
Chrome brick, f.o.b. Eastern shipping points	ton	50-52
Chrome cement, 40-50% Cr_2O_3	ton	23-27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	40-45
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	36-41
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65-68
9-in. arches, wedges and keys	ton	80-85
Scraps and splits	ton	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	48-50
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	48-50
F.o.b. Mt. Union, Pa.	1,000	42-44
Silicon carbide refract. brick, 9-in.	1,000	1,100.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N. Y.	ton	$200.00 - $225.00
Ferrochromium, per lb. of Cr, 6-8% C.	lb.	.11½ - .11¾
4-6% C.	lb.	.12 - .13
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	125.00 - ...
Spiegeleisen, 19-21% Mn.	gr. ton	40.00 - ...
Ferromolybdenum, 50-60% Mo, per lb. Mo.	lb.	2.00 - 2.50
Ferrosilicon, 10-15%	gr. ton	48.00 - 50.00
50%	gr. ton	95.00 - ...
75%	gr. ton	150.00 - 160.00

Ferrotungsten, 70-80%, per lb. of W	lb.	\$0.90 –	\$0.95
Ferro-uranium, 35-50% of U. per lb. of U	lb.	6.00 –	....
Ferrovanadium, 30-40%, per lb. of V	lb.	3.50 –	3.75

Ores and Semi-finished Products

Bauxite, dom. crushed, dried, f.o.b. shipping points	ton	\$6.00 –	\$9.00
Chrome ore Calif. concentrates, 50% min. Cr_2O_3	ton	22.00 –	23.00
C.i.f. Atlantic seaboard	ton	20.50 –	24.00
Coke, fdry., f.o.b. ovens	ton	7.00 –	7.50
Coke, furnace, f.o.b. ovens	ton	6.00 –	6.50
Fluorspar, gravel, f.o.b. mines' Illinois	ton	20.00 –	21.50
Ilmenite, 52% TiO_2	lb.	.01½–	.01¾
Manganese ore, 50% Mn, c.i.f. Atlantic seaport	unit	.33 –	....
Manganese ore, chemical (MnO_2)	ton	75.00 –	80.00
Molybdenite, 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.65 –	.70
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 –	.08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½–	.12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.11½–	.12
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12	
Rutile, 95% TiO_2	lb.	.12 –	....
Tungsten, scheelite, 60% WO_3 and over, per unit WO_3	unit	8.50 –	8.75
Tungsten, wolframite, 60% WO_3 and over, per unit WO_3	unit	8.00 –	8.25
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 –	3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	2.25 –	2.50
Vanadium pentoxide, 99%	lb.	12.00 –	14.00
Vanadium ore, per lb. V_2O_5	lb.	1.00 –	....
Zircon, washed, iron free, f.o.b. Pablo, Fla.	lb.	.04½–	.13

Non-Ferrous Materials

	Cents per Lb.
Copper, electrolytic	.15½–.15¾
Aluminum, 98 to 99%	26–27
Antimony, wholesale, Chinese and Japanese	7½– 8
Nickel, virgin metal	28–30
Nickel, ingot and shot	30–
Monel metal, shot and blocks	32.00
Monel metal, ingots	38.00
Monel metal, sheet bars	45.00
Tin, 5-ton lots, Straits	42.12½
Lead, New York, spot	7.25
Lead, E. St. Louis, spot	7.00
Zinc, spot, New York	6.85
Zinc, spot, E. St. Louis	6.50

Other Metals

Silver (commercial)	oz.	\$0.67½
Cadmium	lb.	1.00
Bismuth (500 lb. lots)	lb.	2.55
Cobalt	lb.	2.65@2.85
Magnesium, ingots, 99%	lb.	1.25–.....
Platinum	oz.	114.00
Iridium	oz.	260.00@275.00
Palladium	oz.	80.00
Mercury	75 lb.	68.00

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	24.25
Copper bottoms	29.75
Copper rods	25.25
High brass wire	19.37½
High brass rods	17.00
Low brass wire	21.10
Low brass rods	22.00
Brazed brass tubing	24.25
Brazed bronze tubing	29.00
Seamless copper tubing	25.25
Seamless high brass tubing	23.50

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

Copper, heavy and crucible	11.60@11.80
Copper, heavy and wire	11.50@11.60
Copper, light and bottoms	10.00@10.10
Lead, heavy	5.75@ 6.00
Lead, tea	3.50@ 3.75
Brass, heavy	6.50@ 6.75
Brass, light	5.75@ 6.00
No. 1 yellow brass turnings	6.75@ .700
Zinc	3.75@ 4.25

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	\$3.29	\$3.14
Soft steel bars	3.19	3.04
Soft steel bar shapes	3.19	3.04
Soft steel bands	3.29	3.19
Plates, ¼ to 1 in. thick	3.29	3.14

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

California

LOS ANGELES—The Pacific Coast Borax Co., Kohl Bldg., San Francisco, has work in progress on the first unit of its new refining plant at Wilmington, Los Angeles harbor, 210x252 ft., for which a general contract recently was awarded to the Davidson Construction Co., 1445 East 16th St., Los Angeles. A power plant will be erected on adjoining site. The structures, exclusive of equipment, will cost \$418,000.

Georgia

EAST POINT—The Marion-Harper Oil Co. has tentative plans under consideration for the rebuilding of the portion of its cotton oil mill, destroyed by fire, May 14, with loss estimated at \$50,000, including equipment.

Florida

ST. PETERSBURG—W. A. Kerr, 338 8th Ave., North, and associates are organizing a new company to construct and operate a local plant for the manufacture of inks and kindred products. Plans will be prepared at an early date.

Illinois

CHICAGO—Fritzsche Brothers, Inc., 82 Beekman St., New York, N. Y., manufacturer of essential oils, has purchased property at 118 East Ohio St., Chicago, as a site for a new plant. Plans will be prepared at an early date.

CHICAGO—Gutmann & Co., 1511 Webster St., operating a tanning plant, will commence the immediate erection of a new 2-story tannery at Webster and Dominick Sts., 78x190 ft., estimated to cost \$125,000, with equipment. I. B. Stern is company architect.

DECATUR—The Home Oil Co., Arthur, Ill., is considering plans for a new branch works in the Cerro Gordo district, Decatur. F. C. Phillips is general manager.

Indiana

INDIANAPOLIS—The Bryan Pyroxylin Co. has arranged for the operation of a new plant at Shadeland Ave. and the Pendleton Pike for the manufacture of composition products.

INDIANAPOLIS — The Fairmount Glass Works, Inc., Keystone Ave., is considering tentative plans for a new plant on property recently acquired at Alabama and St. Clair Sts., 130x195 ft., to be used for the manufacture of hollow-ware products. John Rau is president.

Kansas

WICHITA—The Roxana Petroleum Corp., Roxana, Ill. and Tulsa, Okla., is perfecting plans for the erection of its proposed new oil refinery on property acquired near Wichita, totaling 200 acres of land. The initial plant units will have a capacity of 5,000 bbl. per day and will cost close to \$2,000,000, with machinery. The ultimate refinery will have a total output of 10,000 bbl., and is estimated to cost \$4,000,000.

Kentucky

OWENSBORO—The Owensboro Clay Products Co., recently organized with a capital of \$1,000,000, has preliminary plans for the establishment of a new plant estimated to cost in excess of \$150,000, with machinery. John A. Bolger, Owensboro, heads the company.

Louisiana

BASTROP—The United States Carbon Co. is arranging for the erection of a new plant for the production of carbon black on local site, recently purchased. It will consist of two units, each comprising 36 buildings, with total daily production of 10,000 lb. of material. The plant will cost in excess of \$200,000, including equipment. Leonard Biddison heads the company.

MONROE—The Standard Carbon Co. has plans under consideration for extensions in its local plant, including the installation of additional machinery.

Maine

PHIPPSBURG—The Basin Quarries, Inc., Portland, Me., organized with a capital of \$100,000, has plans under way for the erection of a new feldspar, quartz and mica plant, with pulverizing, screening and grinding departments, estimated to cost \$50,000 with machinery. The mill will have an initial capacity of 30 tons per day. Joseph F. Perry is president, and Frank L. Marston, vice-president.

RUMFORD—The Oxford Paper Co. is arranging plans for a new addition to its bleach plant, 50x216 ft., to provide for an increased output of 1,900 tons of electrolytic bleach and 75 tons of caustic material. Extensions will also be built to the machine and beater buildings.

Maryland

HAGERSTOWN—The Hagerstown Lime & Chemical Co. is completing the construction of a new plant on the State Road, near the city limits, on 112-acre tract of land recently purchased, and will commence operations at an early date for the manufacture of fertilizer products.

WOODLAWN (Baltimore)—The Powhatan Mining Corp., recently formed with a capital of \$100,000, has tentative plans under consideration for the development of an extensive tract of asbestos property and the construction of a mill. Fred A. Mett is president and general manager; and K. H. Kiefer, vice-president.

Michigan

WATERVLIET—The Watervliet Paper Co. will make extensions and improvements in its plant, including the installation of electrical and other equipment.

MARINE CITY—Plans are being arranged for a reorganization of the Independent Sugar Co. and the early resumption of operations at the mill. The property will be offered for sale by the receiver on June 5, and will be acquired by the new interests. Extensions and improvements are planned.

New Jersey

TRENTON—The J. L. Mott Co., Hancock Ave., manufacturer of enameled iron products, has commenced the rebuilding of the portion of its enameling plant, recently destroyed by fire with loss estimated at \$25,000, including equipment.

New York

CORNWALL—The Cornwall Chemical Corp., 111 Water St., New York, is said to be perfecting plans for the rebuilding of the portion of its plant at Cornwall, recently destroyed by fire with loss estimated at \$100,000, including equipment.

GLENS FALLS—The Raymond Pectoral Plaster Co., Thompson Ave., has had plans prepared for the construction of a new 2-story and basement plaster mill, estimated to cost \$25,000. Wetmore & Crandall, Inc., Glens Falls, are architects.

North Carolina

WILMINGTON—The Wilmington Pottery Co. has plans nearing completion for its proposed new plant at Surry and Wright Sts., for the manufacture of cement products. The company will remodel an existing building and install machinery. R. H. Young, Charlotte, N. C., is head.

Ohio

LIMA—The Lily White Oil Co., recently acquired by the Roxana Petroleum Co., Roxana, Ill., to be operated as a subsidiary organization, has tentative plans under con-

sideration for the erection of a new plant for the manufacture of lubricating oils, estimated to cost about $300,000, with machinery.

Pennsylvania

PITTSBURGH—The Waverly Oil Co., 54th St. and the Allegheny Valley Railroad, is having plans drawn for the erection of an addition to its plant to be equipped as a gasoline refinery. It is estimated to cost in excess of $100,000, including machinery. The Hunting-Davis Co., Century Building, is engineer.

NILES—The Ohio Galvanizing Co., Ann St., is considering plans for the erection of a new 1-story addition to its plant, 100x125 ft., to cost about $15,000. F. F. Bentley is head.

PITTSBURGH—The Aiken Oil Co., Crafton, Pa., has purchased property comprising about 2 acres of land near Woodville and Banksville Aves. as a site for a new plant for the manufacture of lubricating oils. Plans have been drawn and work will be commenced at an early date. Complete processing and other machinery will be installed. F. L. Aiken is president.

NEW CASTLE—The Shenango China Co. will make extensions and improvements at its local pottery, including the installation of additional equipment. A number of new kilns will be built.

BETHLEHEM—The Bethlehem Spark Plug Co., Inc., manufacturer of porcelain spark plugs, is arranging to increase production at its plant. The company has contracted to furnish all spark plugs required by the United States Post Office Department for the coming fiscal year.

Tennessee

KNOXVILLE—The American Glass Co. has perfected arrangements for the establishment of a new plant at property recently acquired at 211 West Clinch St., and will install equipment.

Texas

DALLAS—The Shook Rubber Co., 2500-2 South Ervay St., will commence the immediate construction of a new 3-story works to cost about $35,000, exclusive of equipment.

HOUSTON—The Texas Portland Cement Co., Praetorian Bldg., Dallas, is completing plans and will soon commence the erection of an addition to its plant at Manchester, near Houston, estimated to cost about $30,000, exclusive of equipment. Grinding and other machinery will be installed to cost approximately $60,000. William Moeller is general superintendent.

EASTLAND—The Arab Gasoline Co., 23rd and Westmoreland Sts., Philadelphia, Pa., has plans under way for extensions in its gasoline-refining plant at Eastland, estimated to cost about $90,000, including equipment. The company has recently increased its capital to $700,000 for general expansion.

HOUSTON—The Myer-Spalti Mfg. Co. has plans under consideration for the erection of a new plant on local site, for the manufacture of cement and concrete products, estimated to cost $100,000, including equipment.

DALLAS—The Texas Co., 17 Battery Place, New York, is considering plans for extensions and improvements in its oil-refining plants in Texas and other localities, to cost close to $1,500,000 with equipment. The company has acquired a controlling interest in the Carib Syndicate, Ltd., for expansion in its refinery facilities.

HEARN—The Austin Cotton & Planters' Mills, Inc., is having plans prepared for a new cotton oil mill, to be 80x300 ft., estimated to cost close to $60,000, with equipment. Edwin C. Kreile, 803 Scarborough Bldg., Austin, Tex., is architect.

HOUSTON—The Magnolia Paper Co. is completing plans for a new 3-story works at Pickney and Glaser Sts., estimated to cost close to $50,000. Work will soon be commenced.

Washington

VANCOUVER—The Columbia River Paper Mills Corp. will commence the installation of a new acid system at its sulphite plant. Other equipment will be installed later.

West Virginia

CHARLESTON—The Evans Lead Co. has commenced the erection of the first unit of its proposed local plant, comprising a 1-story building, 75x120 ft., and will install machinery at an early date. The company is also planning for the construction of a new laboratory building.

Industrial Notes

THE DORR CO. has moved its New York office from 101 Park Ave. to 247 Park Ave.

THE OILGEAR CO. of Milwaukee, Wis., has recently appointed the Buffalo Machinery Sales Corp., 881 Ellicott Square, Buffalo, as sales representative for Oilgear products in the western New York territory. Announcement is also made that W. D. Creider, formerly in charge of the Milwaukee office of the Federal Machinery Sales Co. of Chicago, has been appointed sales manager of the Oilgear Co. at Milwaukee, and that A. L. Ellis, for the past year acting sales manager at Milwaukee, has been appointed Eastern representative of the company, with headquarters in New York City.

THE PURE CARBON CO., Wellsville, N. Y., has recently established a Minneapolis representative in the firm of Charles A. Etem Co., 917-A Marquette Ave., Minneapolis, Minn.

The offices of the MINING AND METALLURGICAL SOCIETY OF AMERICA are now located at 2 Rector Street, New York City.

GIFFORD-WOOD CO., of Hudson, N. Y., has changed the location of its Buffalo office to the Peoples Bank Bldg., Corner 4th Ave. and Wood St., Pittsburgh, Pa.

THE BARTLETT HAYWOOD CO. announces the removal of its New York office to 1607 Pershing Square Bldg., 42nd St., at Park Ave.

JOSEPH W. HAYS has organized a corps of consulting combustion engineers to be known as Joseph W. Hays and Associates. The headquarters of the organization will be Michigan City, Ind. It is prepared to render consulting service in steam plants in all parts of the country since no change will be made in the place of residence of any of the associates, and each member will look after the engineering work in his immediate territory.

THE GEORGE J. HAGAN CO. has moved its offices from the Peoples Bank Bldg. to the Chamber of Commerce Building, Pittsburgh, Pa.

THE PHILADELPHIA DRYING MACHINERY CO., Philadelphia, Pa., announces that Whitehead, Emmans, Ltd., of Montreal and Hamilton, Canada, will be its Canadian agent.

THE LINK-BELT CO.'s Pittsburgh branch office has been moved to 335 Fifth Ave.

THE CARBORUNDUM CO., Niagara Falls, N. Y., announces the appointment of Harry Collinson as district sales manager in charge of its Milwaukee office and warehouse. Mr. Collinson assumed the position May 1, succeeding J. H. Jackson, resigned. Mr. Collinson was previously district sales manager of the Carborundum Co. in the Province of Ontario. In this position he was succeeded by C. E. Bowman, lately connected with the sales department of Norman Macdonald, who has the agency for Carborundum products at Toronto, Ont.

New Companies

OKLAHOMA FIBER CO., Durant, Okla.; fiber products; $100,000. Incorporators: George F. Beck, Durant; and Guy C. Wallace, Caddo, Okla.

DIAMOND COLOR & CHEMICAL CORP., Jersey City, N. J.; chemicals, chemical byproducts, etc.; $20,000. Incorporators: Arthur R. Oakley and Robert A. Van Voorhis. Representative: Registrar & Transfer Co., 15 Exchange Place, Jersey City.

BAY CHEMICAL CO., Brooklyn, N. Y.; chemicals and chemical byproducts; $100,000. Incorporators: W. Kopp and C. Seifert. Representative: C. O. Echler, 481 Knickerbocker Ave., Brooklyn.

MANOLITE CARBON PAINT CO., Cincinnati, O.; paints, enamels, etc.; $500,000. Incorporators: E. Cunningham and N. C. Kelley, both of Cincinnati.

DENTAPEARL CHEMICAL CO., INC., 1913-15 West Harrison St., Chicago, Ill.; chemicals and chemical byproducts; $10,000. Incorporators: Howard Golden and John E. Rowe.

LYON LEATHER CO., Manchester, Conn.; leather products; capital $50,000. Incorporators: C. E. House, W. A. Strickland and C. R. Burr, 138 Main St., Manchester.

MALTOSE CORP. OF NEW JERSEY, INC., Jersey City, N. J.; glucose and kindred products; 20,000 shares of stock, no par value. Incorporators: John Milton, J. L. Ridley and John J. Tracy, 1 Exchange Place, Jersey City. The last noted is representative.

DIXIE INK CO., Mobile, Ala.; ink, adhesive products, etc.; $10,000. Incorporators: E. C. Bristol, John Whilburn and D. D. Gimon, all of Mobile.

DERMATAN CHEMICAL CO., New York, N. Y.; chemicals and chemical byproducts; $15,000. Incorporators: D. Ambrose, G. W. Moser and A. A. Cone. Representative: A. G. Mintz, 305 Broadway, New York.

CHARLES V. SPARHAWK CORP., Wilmington, Del.; chemicals and chemical byproducts; $200,000. Representative: Colonial Charter Co., Ford Bldg., Wilmington.

PERFECTION PAINT & PRODUCTS CORP., Room 815, 8 South Dearborn St., Chicago, Ill.; paints, varnishes and kindred products; $25,000. Incorporators: Henry Rutz, A. R. Sherick and Mortimer A. Sherick.

ATHENS FIRE BRICK CO., Athens, Tex.; firebrick and refractories; $25,000. Incorporators: T. A. Bartlett, A. S. Coke and C. D. Gregg, all of Athens.

VINE CHEMICAL CO., Jamestown, N. Y.; chemicals and chemical byproducts; $50,000. Incorporators: R. Osgood, L. Vine, and W. C. Davidson. Representative: A. C. Nelson, attorney, Jamestown.

HELVETIA OIL CO., San Antonio, Tex.; petroleum products; $200,000. Incorporators: W. M. Aikman, K. R. Potts and W. C. Steubing, all of San Antonio.

FROST CORP., Wilmington, Del.; glass products; $100,000. Representative: Corporation Trust Co. of America, du Pont Bldg., Wilmington.

M. & L. RUBBER CO., 3025 Indiana Ave., Chicago, Ill.; rubber products; $20,000. Incorporators: W. M. Legnard, A. B. Legnard and A. E. McGregor.

HERCULITE PRODUCTS CORP., Jersey City, N. J., celluloid and composition products; $600,000. Representative: United States Corporation Co., 15 Exchange Place, Jersey City.

LINCOLN OIL MILLS CO., Lincolnton, N. C.; refined oil products; $50,000. Incorporators: K. B. Nixon, R. F. Beal and J. E. Lipscomb, all of Lincolnton.

J. SCHANZENBACH & CO., INC., New York, N. Y.; chemicals and chemical byproducts; $10,000. Incorporators: J. Schanzenbach, A. B. Rose and J. A. Mitchell. Representative: Brown, Cropsey & Nines, 29 Broadway, New York.

BLUE BONNETT LIME CO., Fort Worth, Tex.; lime products; nominal capital, $6,000. Incorporators: A. D. and D. D. Thompson and G. W. Harding, all of Fort Worth.

HAWTHORNE GLASS CO., 3650 52nd Ave., Cicero, Ill.; glass products; 500 shares of stock, no par value. Incorporators: F. H. King, Thomas J. Harper and E. A. Moynihan.

RESISTO PIPE & VALVE CO., 262 Bridge St., Cambridge, Mass.; acid-resisting lined iron pipe, valves, pumps, tanks, etc.; $100,000. E. A. Taft, president; G. A. MacDowall, treasurer.

THORBETTE OIL CORP., Wilmington, Del.; refined oil products; $1,000,000. Representative: Corporation Trust Co. of America, du Pont Bldg., Wilmington.

POLY CHEMICAL LABORATORIES, INC., Jersey City, N. J.; chemicals and chemical byproducts; $25,000. Incorporators: Frank Haber, Louis Rothstein and George P. Williamson. Representative: Ezra L. Nolan, 25 Old Bergen Rd. Jersey City.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

COTTONSEED OIL, sesame oil, soya oil and peanut oil. Belgrade, Jugoslavia. Purchase or agency.—6449.

TIN PLATE for making sardine cans. Vigo, Spain. Purchase.—6459.

PAPER, PRINTING INKS. Rio de Janeiro, Brazil. Agency.—6479.

WALL PAPERS, principally job borders and friezes, both cut-outs and straight. London, England. Purchase and agency.—6471.

ALLOYS of aluminum and silicate, providing 10 per cent silicon. Lyon, France. Purchase.—6486.

PAINTS AND BUILDING MATERIAL. Berne, Switzerland. Agency.—6489.

OXIDE OF TIN (extra light for enameling on iron), in quantity of 2, 3 or 5 ton lots. Newcastle, England. Purchase.—6490.